

POCHA'S GARDEN GUIDE

[FOURTH EDITION]

PUBLISHED BY
PESTONJEE P. POCHA & SONS,
SEED MERCHANTS,
POONA.

PRICE ANNAS TWELVE

Imitation Leather Bound, Rs. 1/4.

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Suggestions on Seed Sowing.

Essentials of success A thorough knowledge of the conditions necessary for the germination of the different kinds of seeds is essential for a successful beginning. The very general want of knowledge in this matter is too often the cause of much undeserved censure upon the seedsman, for, in nine cases out of ten, the failure is not with the seeds, but results from the time or manner of sowing.

How stored Seeds should not be kept long before sowing, but should be obtained a few days before required, and if it is necessary to keep some of them for a future planting, they should be carefully stored in a dry place. If left to themselves they are likely to deteriorate, as moisture and heat have an adverse effect upon them. They should be kept in a tin box with a close-fitting round lid, or better still, in a glass stoppered bottle. This should be put away in a closet or a cupboard where no direct draught reaches them.

Composition of soils Many cases of failure in germinating are due to unsuitable soil conditions. It is physically impossible for young seedlings to send their tender shoots upward through soil which is hard and packed, neither can the young rootlets pierce downwards in such soil. Let the soil be well dug and pulverised. Fine soil should be sifted on top to at least an inch in depth, and if it be heavy or clayey, should be lightened with sand, well-rotted manure, or leaf mould. Soil left in river beds after a flood is very good. If mixed with equal portions of leaf-mould, well-rotted cow or horse manure, it is good for almost any seeds to grow in. Where a good, friable, loamy soil is not easily obtainable, earth from woods, if obtainable in the neighbourhood, will also serve the purpose well. In a damp hollow or ravine, where the trees stand closely together and the leaves lie thickest, the best earth will be found. Scrape aside the leaves and gather the loose, decaying mixture of leaf-mould, fine roots and soil, which is usually from one to several inches in depth. Pick out the larger roots and break up any lumps which will not go through an ordinary sieve. From the roadside or the banks of a stream, gather a quantity of fine, clean, gritty sand. These, together with the surface soil of a meadow where grasses grow freely, in equal parts, make a good compost, suited for sowing seeds. The nature or composition of soil is not so important for the germination of large and vigorous seeds such as Peas, Beet, Beans, Corn, etc., but with the delicate and slow-sprouting sorts as Celery, Parsnip, Brinjal or Capsicum, and with most flower seeds, it is of much importance.

Pots, boxes and tins Where seeds are sown on a small scale for private gardens, it is better to use pots or boxes in preference to sowing them in beds, as they can be removed to the verandah or the sheltered side of a house and protected from heavy rains or direct sun. Pots should be procured before the rains commence, for, during the rains they are difficult to obtain, as the potters do not bake during the wet season. Shallow pots are quite

good for sowing seeds ; large and deep pots are not necessary. It is a good thing to place the pots on bricks or broken crocks to help the drainage. One or more holes, about an inch in diameter, should be made in the bottom of the pots.

Empty whisky cases or boxes, which can be obtained cheaply from any wine merchant or grocer, will be found very useful. Saw them through the middle depthwise, so that the bottom and the top of each will form two shallow boxes, or 'flats' as they are called, with sides about 3 to 4 inches in height. If painted with tar both inside and out, they last quite a while. Kerosene oil tins also cut lengthwise, serve the purpose well, but a few holes should be made in the bottom for drainage.

Drainage Ample drainage in the shape of broken pieces of flower-pots, rough cinders or small pieces of bricks, should be placed in the bottom of the boxes or pots, and over this a layer of rough soil or dried leaves from the garden should be placed. Cocoanut fibre, moss or half-decayed stable litter is also used for the purpose, and should be used wherever possible. These prevent the soil being washed down into the drainage material.

How to sow The pots or boxes should be filled up to about half an inch from the surface, putting the sifted soil on the top, from which all stones, etc., have been removed. Smooth down the top with a wooden board about eight inches square, to which a small handle has been attached at the centre. Then, with a pointed stick, mark out rows about half an inch deep, at distances of, say, two or three inches, in the boxes or pots and of about six inches in the beds. Drop the seeds in, a little pinch at a time in the rows, taking care to see that too many of them do not fall in one spot. Very small seeds may be sown broadcast. Sow large seeds one by one, an inch apart, sift earth over all to cover them as deep as about three or four times their diameter, and then press down firmly again with the board or the palm of the hand. Hard-shelled seeds like Cannas, Ipomœas, etc., should be soaked in warm water for about 24 to 48 hours before sowing or they may also be kept in cow dung paste for 2 to 3 days and then immediately sown. This hastens germination considerably. Then lay over the soil a piece of thin cotton cloth (this is not absolutely necessary) and water with a fine spray, or a watering can with a fine rose, thus sprinkling the water very gently and in small drops. The cloth should be removed as soon as the seeds show signs of coming up. In bright or dry weather, the use of a pane of glass over the pot retards quick evaporation and helps uniform germination. The glass should be removed as soon as seedlings show above ground.

Depth of sowing Large seeds like Nasturtiums, Sweet Peas, Beans, etc., should be covered about one to two inches deep, and smaller seeds according to size ; the usual rule being to cover them about 3 to 4 times their diameter. Very small seeds, like Begonias, Gloxinias, Mimulus, etc., should be first mixed with a handful of fine, sifted soil, and evenly distributed over the surface and pressed down gently but firmly as before. Great care should be exercised in opening a small packet of any of these fine seeds, as an awkward jerk, or a light puff, will scatter a whole packet of expensive seeds.

Rough or injudicious watering is also a frequent cause of failure, especially in the case of small seeds, like Begonias, **How to water** Gloxinias, etc., and it is an excellent plan to water the soil before sowing the seeds, and then, after sowing, to stand the pot in another pot or pan half filled with water. Thus the soil soaks the water from the bottom, and overhead watering is avoided. Care must be taken to replenish the water in the lower pot from time to time. It is also necessary to lift the pot daily from the lower one containing water and allow it to stand by itself for a few hours and change the water frequently. This enables extra moisture to drain off, as stagnant water is detrimental to germinating seeds and seedlings.

Many people fail to grow some of the tiny expensive seeds by the ordinary method. The following method, though **TINY SEEDS—** novel, is found to succeed admirably in raising tiny **A Novel Method** seeds like Begonias, Gloxinias, Calceolarias and even Fern Spores. Secure a galvanized pan, made by a local tin smith, about four inches deep, and large enough to hold an ordinary porous, building brick, without touching the sides of the pan. Take a mixture of light garden soil two parts and fine sand one part. Though not absolutely necessary, it is a good thing to bake the soil to kill weed seeds and fungus spores. The soil is then passed through a sieve and moderately dampened. Apply this soil to the brick to a depth of half an inch or more, sloping it off along the edges to finish, which prevents its crumbling off. Put enough water in the pan so the brick is wet up about an inch, when by capillary attraction the soil will be kept uniformly moist. As soon as in place, lightly sprinkle the seeds on the surface of the soil and place in a shady place where the light is not too bright. If the soil should appear too wet—which rarely happens—just lift the brick out for a few hours and then replace.

The intervals of watering must be regulated by weather conditions.

When to water In dry weather, water at least once every day. The best time to water is in the evening. Water as soon as the surface soil begins to show signs of drying. Never let the soil dry out completely. Growing seeds do not require too much water at a time; small quantities at short intervals is best.

In sowing, it must be remembered that, after germination the young plants have to be handled for transplanting; **Avoid thick sowing** if the seedlings are very close together, this will entail much trouble and probable injury to the plants. If sown too thick, the resulting plants will be weak, and, if damp weather prevails in the very early stages of the plants' life, fungoid disease will spread among them and decimate them.

It frequently happens that young seedlings die of a sudden and within a few hours, due to the above cause, technically **“Damping off”** known as “damping off.” This is brought about by several causes, the most frequent being injudicious watering. If young seedlings are kept dry longer than is good for them and then, when they begin to wilt, are copiously watered, they succumb easily to the above fungoid disease.

This will seldom happen if the following precautions are taken:

How to avoid it Do not sow too thick; give as much light and air to the plants as possible, without exposing them too much to the mid-day sun. Water carefully, that is, before the plants begin to suffer for want of it. As soon as

it is found that seedlings are beginning to die, the best thing to do is to remove those which are alive—no matter how small—to another part of the garden and re-plant them in fresh soil (which, on no account, should be too wet or cold), and to give them more light and air. A damp and close atmosphere is conducive to the growth of fungus diseases, and is a root cause of the trouble. The disease spreads very quickly; seedlings in close proximity with the affected ones should also be removed, therefore, to a safe distance.

The above hints on sowing generally apply to seeds of such plants as require transplanting. Before seeds are sown, therefore, it should be ascertained that they belong to the above group. Among vegetable seeds, there are many, such as Peas, Beans, etc., which require to be sown direct in their permanent quarters. These will be found in Part II of this Guide under the different headings. Among flowers, there are comparatively few that do not stand transplanting well. Among these, the most prominent are: Candytufts, Hollyhocks, Ipomceas (including Convolvulus and Mina), Larkspurs, Mignonettes, Nasturtiums, Poppies, Portulacas, and Sweet Peas. These are best put down in the places where they are to flower, and if they come up too thick, should be thinned out by picking off some of the smaller plants, leaving those which look large and healthy.

Almost all the other flowering plants are benefited by being transplanted. They should never be allowed to grow too long in their seedling beds, as they soon begin to crowd themselves out, and thus become weak and prone to immature flowering. Transplanting should be done as soon as they have formed about three or four true leaves (not seed leaves or cotyledons). A few hours before transplanting, the seedlings and also the ground they are to be transplanted to, should be watered, so that the two soil conditions be about equal. The best time to transplant is soon after a shower of rain, or in cloudy weather. If these conditions are not prevailing, select an evening for the operation, as the plants then will have the whole night to establish themselves somewhat, before the sun comes up the next day.

When transplanting, great care should be taken not to injure the roots. The operation should be done with a gentle hand. **How to transplant** Take a KHORPI or a small transplanting-trowel and insert it into the soil, taking out a few seedlings. Separate these carefully, and plant them one by one, in holes just large enough to receive them. Then gently press down the soil near the roots with your fingers. It often happens that the leaves of newly planted seedlings—especially the lower ones—get stuck to the soil after being watered. This causes decay of the plants, leaving gaps in the beds. It is, therefore, well to go over the beds with a thin, pointed stick, and so lift the leaves from the ground. It is also advisable to keep a few seedlings reserved for an emergency, as some of them may die and leave gaps in the flower-beds, which can be thus filled up. In hot or sunny weather, a slight shade over the newly planted seedlings is desirable. Small, leafy twigs of trees inserted a few inches apart, in between the plants, afford a good shade. These may be removed after a few days, when the plants have established themselves.

Should, however, time and labour be available, it is a very good plan to transplant the seedlings as soon as they are large enough to be handled, into other boxes or beds **Transplanting** "in excelsis", similarly prepared, (but with the soil made a little richer by an additional amount of manure), about an inch or more apart each way, and then, when they have made more growth and begin to crowd, to plant them out in their permanent places. When seedlings have been in their second boxes for two or three days, they may be allowed more sun and light and air to harden them. This usually prevents the young seedlings from being "damped off," and makes them more sturdy; altogether, they make better and healthier plants, and well repay the extra trouble of transplanting a second time.

When seeds, especially vegetable, are to be grown on a fairly large scale, they are usually grown in beds, specially **Sowing seeds in beds** prepared for them, above the level of the surroundings, to ensure free drainage, particularly during the rains. See that the soil is not wet, and a top layer of about two inches or so, is passed through a sieve. If the soil is very wet and cold, the seeds are likely to fail; a dry soil is better than a wet one for sowing. Water the beds thoroughly a few hours before sowing and sow the seeds as directed above, in drills (or straight rows), letting them run along the narrow or shorter length of the beds. Cover the seeds more deeply than when they are put down in boxes or pots, say about five times their diameter. Do not flood the beds with water but sprinkle the water carefully whenever required, from a fine-rosed watering can or spray. If the presence of insects is suspected or is known from previous experience, it is a good plan to pour boiling water over the seed-beds a few hours before sowing. This will kill the eggs of snails and slugs which are so destructive to growing seeds.

PEAS, BEANS, AND MAIZE—These seeds are usually of large size and vigorous germination, and there is very little trouble in growing them, still sometimes they fail to germinate and on removing the soil covering them and examining the seeds, they are found to have rotted. This happens if they are sown in a wet, damp and cold soil, especially during a long spell of wet weather. The round-seeded peas are not so susceptible to rot as the wrinkled peas—and similarly the Field Corn which are usually smooth and large seeded, are not so susceptible as Sweet or Table Corn. This is due to the large quantity of sugary matter contained in these highly bred seeds, which causes them to decay in a cold and wet soil. Thus, it often happens that acclimatised peas—even those of the wrinkled type—which have not been grown with an eye to improvement, germinate freely, while imported seeds with a larger percentage of sugary matter, put down side by side, fail to come up, and rot in the ground. These seeds are best put down, therefore, in a freshly prepared, warm soil, which has been frequently turned over, and in a sunny and open situation. This is the most frequent cause of failure of these seeds. The same remarks apply to such oily seeds as Pumpkins, Marrows, etc., but only in a lesser degree. It must be remembered, that seeds and roots require air as much as growing plants, and, if the soil is not loose, but wet and cold, it gets impervious to air, in consequence of which they suffer and die.

The majority of seeds usually grow within a week or two.

Time seeds take to germinate But there are some seeds which take longer and one should know how long to wait before giving them up finally. Among vegetables, Celery seeds usually take from three to six weeks

to grow, and often refuse to sprout even after this period, if the weather is not favourable to their growth. So also do the Parsnip, Leek, Onion, and some of the pot-herb seeds, like Lavender, Cat-mint, Rosemary, Thyme, etc. The germination of these seeds is also capricious and uncertain, as they seem to be more fastidious in their climatic requirements than to the soil conditions.

Capriciousness of seeds A cool and equable temperature seems to be the most favourable to their growth. Among flowers, there are many, like Anemones, Larkspurs, Clematis, etc., which take from four to eight weeks—or even much more—to germinate. Such seeds should be looked after more carefully, and watered regularly, and the surface soil examined from time to time to see that none of the seeds have been exposed, as occasionally happens, after a few weeks, due to the washing away of surface soil. In this case, a fresh layer of soil should immediately be put over them to cover the

Care of "difficult" seeds seeds sufficiently. Another difficulty in growing these seeds is that the surface soil, if not of the right kind, is likely to get packed or baked so hard that seedlings cannot break through the crust that is formed, and therefore die. To overcome this, prepare

the soil in the usual manner, and after putting down the seeds, do not rake the seeds in or cover them with any soil; but instead, use some very old and thoroughly decomposed farmyard or stable manure, after passing it through a half-inch sieve, and spread this carefully over the seeds to a depth of about half an inch or a little less, according to the size of the seeds. We give below for reference, a list of the more important of the seeds which usually take a long time to grow:—

From 2 to 4 weeks or a little longer.

Vegetables—Asparagus, Leek, Parsley, Parsnip, New Zealand Spinach.

Flowers — Alonsoa, Anchusa, Asparagus (Ornamental), Perennial Asters, Bidens, Clitoria, Cyclamen, Datura, Eucalyptus, Geum, Heliotrope, Kudzu Vine, Perennial Linum, Martynia, Matricaria, Mimosa, Myosotis (Forget-me-nots), Nemesis, Ranunculus Scabiosa Caucasica, Smilax, Solidago, Stipa, Xeranthemum.

From 3 to 6 weeks or a little longer.

Vegetables— Balm, Cat-nip (Mint), Celery, Celeriac, Lavender, Rosemary, Savory, Thyme, Papaya or Papita.

Flowers—Abronia, Agapanthus, Alyssum Saxatile, Amaryllis, Arctotis, Aristolochia, Begonia, Canna, Japanese Chrysanthemum, Cobæa, Cynoglossum, Euphorbia, Gaura, Gerbera, Hedysarum, Heuchera, Hibiscus, Humulus, Ladies' Lace, Lychnis, Nigella, Passiflora, Polygonum, Verbena Venosa.

From 1 to 3 months or longer.

Flowers— Abutilon, Adonis, Agathea, Ampelopsis, Anemone, Aquilegia, Bignonia, Cactus, Calceolaria, Camphor, Clematis, Cyperus, Delphinium, Freesia, Fuchsia, Gladiolus, Gynerium Argentium, Helenium, Hyacinthus Candicans, Hunnemannia, Larkspur, Perilla, Primula (including Auricula and Polyanthus), Rosa Polyantha, Tecoma, Tritoma.

From 6 months to a year or longer.

Fruits—Raspberry, Strawberry.

Flowers—Acacia, Dictamnus, Lantana, Perennial or Decussata Phlox, Viola Odorata (Sweet Violet).

It may be noted that the above applies only to seeds and their different varieties as offered in our catalogue, and that the time given is only approximate, and many seeds will germinate much earlier than the time indicated, if weather be favourable. Our long and practical experience in growing these and many other seeds has enabled us to make the above list as comprehensive as possible, but still the uncertainty of seeds is so great, and different climates and soils have such varying effects on different seeds, that one is likely to find much variation in the times indicated above. In the majority of cases, under normal conditions, however, they would form a good guide.

It may also be noted that there are some seeds like Phlox Drummondii, Pansies, Verbenas, etc., which, though they usually germinate freely in about 2 weeks, sometimes, owing to weather conditions, fail to show themselves above the ground, for 3 to 4 weeks, or even a little longer. A little patience with them usually pays well. But if seeds put down rather late in the season refuse to come up within a reasonable time, it is advisable to make a second sowing to make sure of a supply. White-seeded Sweet Peas are usually hard-shelled, and take longer to germinate. But, if the covering of the seeds is cut open in one place by a sharp knife, or if they are soaked in warm water for about 24 to 36 hours before sowing, they come up more quickly. Canna seeds, similarly treated, come up quicker and better.

A careful look-out should be kept for ants which are very destructive to seeds, as they carry them off continually. If **Ants and their enemies** crude (or ordinary) kerosene oil is sprinkled, they will leave the spot for some time but care should be taken that the oil does not come in direct contact with the seeds. The ants do not usually appear on the surface but work their way through the holes in the bottom of the pots, underground. The presence of small holes on the surface is a sure sign that ants are busy. So also are birds, squirrels, mice, etc., fond of seeds—especially of oily seeds, like Cabbage, Cucumber, Marrows, Lettuce, etc., and one must therefore guard against their depredations.

If the presence of some insects is suspected, pour some boiling water on the soil and sow on cooling. Again, when seedlings come up, dust soot on them.

The immersion of seeds for a few minutes in two percent. copper sulphate solution is also a good preventive. Copper Sulphate (Vern. Morthuthu or Morchu) is easily obtainable everywhere and is soluble in water. Naphthaline powder dusted on the seed-beds is also found to repel ants. Powdered turmeric (Vern. Hulder) has also a similar effect.

If broken pieces of cocoanut (with the kernel) or fresh bones (with some meat on them), are put near the seed beds, the ants are attracted to them in large numbers and can be destroyed by immersing them in hot water. This will have to be repeated several times till the ants disappear.

Another plan, when a nest of red ants is found, is to bund the spot round with clay and pour in boiling water; this is found to be very efficient in the destruction of red ants.

Take one gallon kerosine oil and half a pound sunlight soap. Make small pieces of the soap and dissolve it in hot water to a thick consistency. Boil the kerosine oil on a gas stove (or if gas is not available on a coal fire) using a vessel at least three times larger than the actual capacity of the oil requires—and when the oil begins to boil, which it will do within a short time, slowly add the prepared soap and constantly stir the oil till it is fully mixed with the soap. This process is dangerous and great care should be taken to see that no spark of fire gets in to the oil, otherwise the oil will at once ignite. Keep a large quantity of sand handy in case of an accident. While preparing the above emulsion, care should be taken that the oil fumes do not enter into ones lungs or eyes. A pair of goggles and a light bandage over the nose may be used though not absolutely necessary. The above can be applied to wood or any furniture or can be sprinkled where white ants abound and is found very effective. If a nest of white ants is found, it should be dug up and the queen ant found and destroyed. (See also p. 94 for other useful hints.)

An ant colony consists of many individuals divided into different castes. The majority of the members of a colony, however, are worker ants. They gather the food, store it and feed the young larvae in the nests. Another very important member in the colony is the queen, or mother. Not like the bees, among whom only one queen is allowed in a colony, an ant colony may have two or more queens. The queens are the only members that lay eggs. During certain seasons of the year winged ants may be seen leaving the nests. These are males and females of the colony, each couple starting out to begin housekeeping for itself. Fortunately for our peace of mind, many couples perish.

The little red ants that make the small rings of soil on the lawn and the cement sidewalk are perhaps the hardest to control. Injecting boiling water, kerosene, old crank-case oil, or gasoline into each burrow is often effective. Calcium cyanide has been recommended. On lawns, carbon bisulphide will do least injury. Powdered sodium fluoride scattered where the ant rings are thickest will eventually eliminate the pests. In the use of all or any of these materials against this form, it is a case of finding out if you are more persistent than the ant. It is simply a case of continually keeping after them.

The ants that build good sized mounds or nests are easily eliminated by carbon bisulphide. Make several deep holes in the mound, about 6 inches apart. Into each hole pour a quarter of a cup of carbon bisulphide. Cover the nest with a wet sack or rug to keep in the fumes and keep covered for ten or twelve hours. Do not forget that carbon bisulphide is inflammable.

For ants that work in hollow trees, carbon bisulphide may be injected.

Certain ants may often be found making galleries around the roots of plants like asters, calendulas, and others. These ants are paying attention, to and waiting upon, the plant lice which are working on the roots of these plants. Nicotine sulphate diluted at the rate of one to 800 poured around the roots of the plant will kill the plant lice and hence remove the ants.

Any of the ants mentioned may find their way into houses. When they have found a good source of food supply it is impossible to keep them away unless drastic measures are taken. If one is patient enough he can trace ants back to the nest and destroy it with the methods mentioned. An easy way by which to trace the ants is to give them a little granulated sugar and then watch them carry it away. If the nest, however, is beneath the floor or in the walls of the basement this method is impractical. One is to sprinkle sodium fluoride over their favourite runways. Another is to place in small boxes with tightly fitting covers a poison substance that these workers will carry back to the nests to feed the young and the queen. The boxes should be so arranged that with the cover partly pressed on the ants can find their way into them through small openings and have easy access to the poisoned material. This poison may be put on bits of sponge and left around but if placed inside the box the poison is not so likely to be disturbed by children and small domesticated animals.

There are several of these poison bait formulas. Some suit one species of ant better than another. The only way to succeed in the control of the species you have is to try the different baits until the proper one is found.

Poison Baits

Formula No. 1

Granulated sugar.....	1 $\frac{1}{2}$ pounds
Water	1 $\frac{1}{4}$ pints
Tartaric acid, crystallised	15 Grains
Benzote of soda	15 Grains

Boil these materials together for thirty minutes then dissolve:

Arsenate of soda.....	$\frac{1}{8}$ ounce or 60 Grains
in	
Hot water.....	1 fluid ounce

When these two solutions have cooled add the second to the first and stir well. Then add two-thirds of a pound of strained honey to the resulting syrup and mix thoroughly.

Formula No. 2

Sugar.....	$\frac{1}{2}$ pound
Arsenate of soda.....	$\frac{1}{4}$ oz. or 1 level teaspoonful
Water.....	1 pint
Honey (improves).....	1 teaspoonful

Dissolve the sugar in the water, add the arsenate of soda, and boil until all is dissolved.



PART II

VEGETABLES

ARTICHOKE, GLOBE OR FRENCH.

Cynara Scolymus. Nat. Ord. *Compositæ*.

This perennial plant, which is a native of North Africa and Southern Europe, is not much cultivated in India, but in Europe, especially in France, Italy and Great Britain, it is extensively grown, almost every garden having at least a few plants. It is a large-growing, thistle-like, quite an ornamental plant and is fairly hardy in cold countries, requiring only a covering of leaves, straw or stable litter in the winter.

The fleshy scales and the soft base of the flower-heads are the much esteemed portions and may be eaten raw, but are usually boiled and served with butter sauce or as "Artichoke Salad," or are pickled after cooking. The suckers or young side plants when tied together to blanch are used as Asparagus, while the mid-ribs of the larger blanched leaves are used as "Chard."

It seems to thrive in many parts of India with little attention, and when planted in well-drained soil, will live through the heat and damp of our summers and monsoons.

The Artichoke may be propagated from seed, or by dividing the stools, or from suckers. The last method is the one most usually employed, as it is the only one by which the different varieties can be reproduced true to their proper character.

On the plains, seeds are sown from middle of August to end of October or earlier—say in June-July—if the weather is not hot and the rainfall not too heavy, and on the hills, from beginning of March to end of May. As soon as the seedlings are large enough to be easily handled, they are transplanted into beds in rows 4 feet apart, and about 2 feet from plant to plant in the rows. If the soil is very rich, a greater distance will be necessary.

Globe Artichokes will thrive in any good garden soil, especially in one which is loose and deep, though it will also thrive in heavier soils. Before planting, the ground should be deeply dug and liberally manured. The plants are greatly aided in their growth by wood-ashes and sea-weeds where procurable.

A plantation of Artichoke usually lasts from 3 to 4 years in cold countries and on hill stations, and can be renewed with success from year to year by offsets.

For the family garden, only a few plants will be required, as well-established plants produce a number of heads each year. These heads should be removed if not required, for, if allowed to ripen, they reduce the vitality of the plants. When gathering the heads, if the whole stem is also cut off near the ground, new suckers and flower-stems will shortly appear, thus keeping up a successive supply for a long period.

The seeds take from 10 to 14 days to germinate. An ounce contains about 500 seeds. The plants flower within 4 to 5 months after sowing seeds. About 12 ounces of seeds are required to sow an acre.

ASPARAGUS.

Asparagus Officinalis. Nat. Ord. *Liliaceæ*.

The Asparagus is a perennial plant, native of the sea coasts of Europe and of some parts of Asia.

The young shoots, blanched by being earthed up, and gathered as soon as the points appear over ground, are used as a vegetable. The Asparagus is boiled in bundles standing on end in water, leaving an inch or so of the points above the water. This method thoroughly cooks the stems without destroying the tops, which, if they remain a little under-cooked by the steam, are readily finished by laying the bundle on its side for a few minutes.

This delicious vegetable grows readily in most parts of India, but in quality it does not compare favourably with the one grown in Europe. A rich, friable, well-drained soil which is loose or sandy should be selected. Clayey soil, which is very retentive of water, is unsuitable. As the Asparagus bed lasts for several years, it requires a very thorough preparation. Dig very deep—say about eighteen inches—and incorporate a liberal quantity of manure with it, a layer of 6 to 8 inches of manure being none too much, as the Asparagus is a very gross feeder.

To start an Asparagus bed, one may either raise his own plants or purchase them ready for use where obtainable. The latter method saves some time, but good Asparagus plants are rarely obtainable in India. The seed beds should be made of very loose, mellow earth, both rich and sandy. The seeds may be sown in drills about 6 to 9 inches apart, at a distance of about half an inch apart in the rows, and covered about an inch deep. When they come up and begin to grow, they must be thinned out, so that they stand about two inches apart in the rows. They should be freely and frequently watered and kept free from weeds and cultivated occasionally, and should never be neglected or allowed to suffer for want of water or sufficient nourishment. Here they may be allowed to grow for about two to four months, according to the season and the growth of the plants. That is, if the seeds have been put in early, they may stand longer in the seed beds; or if they have made quick growth and are getting overcrowded, they must be planted out sooner. When the Asparagus is grown on a small scale, it is generally planted in trenches at least one foot wide and 18 inches or more deep and from 3 to 4 feet apart. The plants may then be set in the centre of the trenches, at a distance of about 12 to 18 inches apart, taking great care to see that the roots are not injured and are spread out carefully. Here the plants should be encouraged to grow luxuriantly, and may be fed frequently with liquid manure.

In cold countries where plant growth is not very rapid, it is not advisable to cut the shoots before the third year, but in our country, a fair number of shoots may be cut in the second year. The ground should be frequently cultivated, working the soil toward, rather than away, from the plants. In the cold season, the stems usually die down and must be cut off. The plants then remain dormant, and when they again show signs of active growth at the approach of hot weather, some of the top soil should be removed carefully and a good top-

dressing of manure given to the plants which will induce them to throw up many shoots. An application of salt or kainit in the spring, broadcasted at the rate of 2,000 pounds per acre or about 5 pounds to 100 sq. feet, or of pure bone-meal at the rate of from 500 to 1,000 pounds per acre, spread broadcast, then hoed in, will be found very beneficial and profitable. Asparagus is a heavy feeder and it is hardly possible to overdo the fertilizer.

Another way to grow Asparagus from seeds is to manure the ground heavily, plough and prepare it as thoroughly as possible and then put the seed directly into the rows where the Asparagus is to grow permanently, using about two to three pounds of seed per acre. Or an ounce of seed will sow a row about 60 feet long. Cover the seeds about an inch deep and water thoroughly. When the plants come up and are about 3 to 6 inches high, they should be thinned out to stand singly and from 12 to 18 inches apart in the row. Keep the soil constantly stirred and free from weeds, and water copiously when necessary.

On the plains, seeds may generally be sown from August to November or earlier—say in June-July—if the weather is not hot and the rainfall not too heavy; and on hills, from February to May. From 400 to 600 roots will give an ample supply for a family of six or eight persons and 10,000 to 15,000 plants according to width of rows, are required for an acre. The average yield per acre in one year is about 12,500 pounds.

BROAD BEANS.

Faba vulgaris; *Vicia faba*. Nat. Ord. Leguminosæ.

Originally found in the East, probably in Persia. Annual. This plant has been cultivated for many centuries, its large size and the alimentary properties of its seeds having drawn attention to it.

It is an erect growing plant, thriving best in a heavy or clayey, though rich soil. It will also thrive on a deep, sandy loam which, it may be noted, is good for almost any vegetable.

There are two classes of Broad Beans—the Broad Windsor and the Longpod. The former is rather difficult to grow in India, though it does very well on hill stations. The latter seems to be more adaptable and can be grown almost everywhere.

Sow the seeds about two inches deep, in rows of double drills one foot apart, with a space of three feet between each row of double drills. The seeds may stand about 4 to 6 inches apart in the drills. Sometimes, seeds may not come up well, especially in dry soils. It is then advisable to soak them for a few hours in warm water before planting, though this is not always essential. When the plants begin to flower, nipping off the tops will induce the plants to set freely and will also prevent them from being attacked by aphides.

In places exposed to heavy winds, it is better to support the plants by sticks. The seeds or beans are eaten boiled, both in the green and in the dried states.

In Northern India, sow from middle of October to end of November; not earlier, as the young plants cannot stand the heat well. In other places, sowings may be made about 6 to 8 weeks earlier. On the hills, sow from March to the end of May. A pound of seed will sow

a row of about 30 to 50 feet long. They take about 3 months to be ready. If the beans are wanted for a longer period, make two or three sowings at intervals of about 20 days.

FRENCH OR KIDNEY BEANS.

Phaseolus vulgaris. Nat. Ord. *Leguminosæ*.

Native of South America. Annual. These are divided into two main classes—Climbing and Dwarf or Bush. The former are more prolific and have a longer season, though not quite so easily grown as the latter.

Dwarf Beans—During recent years, plant breeders have greatly improved the bean, producing varieties which contain a much greater proportion of flesh and are entirely free from strings or any fibre in the pod.

The Dwarf or Bush Bean, while responding to rich soil and thorough cultivation, will succeed well in almost any garden soil. Beans are very sensitive to both cold and wet and should not be sown in continuously wet and cold weather, or in cold or wet soil. (See remarks under the heading of "Peas, Beans and Maize" in Part I.) A light shade of tall trees and protection from heavy winds is desirable. As they are ready within two months, it is advisable to sow them in succession at intervals of a fortnight each. On the plains, sow from middle of August to end of October or earlier—say in June-July—if the weather is not hot and the rains not too heavy, and in favourable localities even a little later than October, and on the hills from end of March to end of June. The ground should be well prepared and the seeds sown thinly in rows about 18 to 24 inches apart, letting the seeds drop at a distance of about 3 to 4 inches in the rows. One pound of seed will sow a row of about 50 to 60 feet or about 60 pounds of seed will sow an acre. As soon as the young plants appear, the soil should be stirred and cultivation should be kept up as frequently as possible during the entire season of growth. The gathering of pods should begin as soon as they are large enough for use,—the half-grown pods being the finest for table use. By picking the pods as fast as they are ready for use and keeping the soil well stirred, the plants will continue in bearing much longer than if allowed to ripen seed. The average yield per acre is about 1,500 pounds of dried beans.

Runner or Pole Beans—These require about the same treatment as above, except that they are planted in holes (or "hills" as they are called) instead of in rows. The season of growth and bearing is longer than that of the Dwarf Beans. It is necessary to make the soil very rich if a very large crop is desired. For field plantings about twenty tons of stable manure per acre is needed. Use strong poles or bamboos about 1½ to 2 inches in diameter at the bottom and about 6 to 8 feet long. Insert them firmly in the ground, setting them at a distance of about four feet apart each way. Then near the pole, sow about six seeds, covering them about two inches and when they come up and have made some growth, leave only three of the strongest plants, pulling out the others, and train them on the poles by help of small twigs or strings, remembering that the vines have a habit of twining from left to right. If economy in manure is to be made, then holes should be made where the poles are inserted, about 2 feet wide and as much deep and filled up with rich earth and manure, and the seeds sown in them.

Where poles are unavailable or undesirable, posts or stout stakes are set at each end of the row where the beans are to be planted and two wires—rather heavy—are then stretched over the supports at each end of the row, one about four inches from the ground and the other about six feet. Then, any kind of cheap but fairly strong twine is tied between the wires for the vines to run on. The strings may be spaced about 2 feet apart along the row and one plant allowed to grow on each string.

It is claimed by some that the beans require a certain kind of bacteria in the soil for their best development and that if the same ground be used year after year, the bacteria increase in numbers and the beans grow much better than if they are planted every year in fresh soil.

About two pounds of seeds are required for 100 hills. Or about 25 pounds are required to sow an acre. They take about 65 to 80 days to be ready after seeds are sown.

SCARLET RUNNER BEANS.

Phaseolus multiflorus. Nat. Ord. *Leguminosæ*.

This is a perennial of climbing habit and a native of South America. It does well in Northern India and on hill stations, and produces very ornamental flowers followed by pods. Its rapid growth and ornamental character lends it admirably for growing it as a screen. It is grown in much the same manner as other Runner Beans, the seeds being sown at about the same time. If grown on poles, they may be inserted in the ground, in threes and slanting towards one another at the top where they may be tied together, thus making a pyramid, or they may be grown on stakes a little stronger than those used for peas. They get ready in about 2 to 3 months after sowing.

The Scarlet Runner does not thrive on the plains of Southern India, where, however, the other varieties of Runner and Lima Beans do very well.

LIMA BEANS.

Phaseolus lunatus. Nat. Ord. *Leguminosæ*.

Native of South America. Annual. The Lima Bean is sometimes called Butter or Double Bean. It is grown in many parts of India and Burma, but is not cultivated as largely as it should be. In the warmer sections of the United States of America, it is grown very extensively on a commercial scale.

The tall growing varieties of Lima Beans are grown in the same manner as the ordinary Pole or Runner Beans, but take a little longer to mature. The seeds are used either green or dried, and have a very fine meaty flavour, and being farinaceous are highly esteemed wherever grown. There is also a dwarf or bush form of this Bean which requires no poles or strings and grows just like the Dwarf French or Kidney Beans. The Bush Limas are about two to three weeks earlier than Pole Limas, taking from 70 to 80 days to be ready. The average height of the Bush Limas is about 18 inches.

These may be sown in drills about 2 to 3 feet apart, dropping the beans (seeds), eyes downwards, about 4 to 5 inches apart, and covering them about 2 inches deep. They should not be planted in cold or wet ground as, in this case, they are likely to rot.

Those who are not familiar with the growth of the Bush Limas frequently mistake the long blossom shoots (which, early in the season, show above the foliage), for runners or vines, but if these shoots are carefully examined they will be found to terminate in a cluster of blossoms and entirely free from the twist or curl which appears in the shoots of the Pole Limas.

BEET ROOT.

Beta vulgaris. Nat. Ord. *Chenopodiaceæ*.

This is a hardy biennial, native of the sea coasts of Southern Europe, and cultivated for its fleshy roots. The short or round-rooted varieties are earlier, and better adapted to shallow soils than the long-rooted. The beet grows best in a deep, rich, well-manured and well-tilled soil. The seeds are sown where they are to grow, in drills about 15 to 18 inches apart at distances of about 2 to 3 inches apart. The seedlings are then thinned out to a final distance of about 6 inches. If required for the home table, the roots should be pulled when about half grown and not allowed to mature.

On the plains, sow from August to November or even earlier—say in June-July—where the weather is not very hot and the rainfall not too heavy; and on the hills from March to May. One ounce of seed will sow a drill about 40 to 50 feet long. Four to five pounds are required to sow an acre. Table Beets are ready in about two months' time and Mangel Wurzels (Mangolds) and Sugar Beets take about three months or more to mature. The mangels are very extensively cultivated in cold countries for feeding cattle, as they keep very well throughout the winter. The average yield of Table Beets per acre is about 10 tons and that of mangolds is 20 tons.

To grow clean, handsome roots, the ground should not be rank or freshly manured. If a plot which has been heavily manured for a previous crop is available, so much the better. Otherwise, the roots will either overgrow in size or become forked and ugly. A little top dressing of salt is also advantageous.

Swiss Chard (Leaf-Beet, Spinach-Beet, Silver-Beet or Sea-Kale Beet)—A distinct species from the common Beet (which is grown for its roots), the Swiss Chard is grown for its leaves. Cultivation is the same as that of the common Beet, except that the soil need not be so deeply dug. The seeds are sown in drills 16 to 20 inches apart and the plants thinned out to a distance of about a foot or more apart. The leaves are eaten, minced and boiled, like Spinach leaves. The mid-ribs of the leaves are stewed like Asparagus. An ounce of seed will sow a drill 100 feet long.

BORECOLE OR KALE.

Brassica oleracea acephala. Nat. Ord. *Cruciferae*.

This is a curly, loose-leaved plant of the Cabbage family, of a hardy character, capable of standing any amount of frost on hilly stations, but not much grown in India. Its leaves are used as "greens." It

cannot be recommended for general cultivation on the plains of India, as it is essentially a cold weather plant and frost and a high elevation bring out its best qualities. The curly leaves are very ornamental and a few plants grown in any garden are very effective.

Sow seeds in seed-beds and transplant when about 2 inches high into drills about 2 feet apart, setting the plants about 8 to 10 inches apart in the drills. On the plains sow during September and October; on the hills from March to May. Half an ounce of seed will sow a row about 100 feet long, or 3 to 4 pounds will be required for an acre. It takes about two to three months to be ready.

BROCCOLI.

Brassica oleracea Botrytis. Nat. Ord. *Cruciferae*.

The Broccoli, like the Cauliflower, is a cultivated variety of the wild Cabbage, and is grown for its head, which is similar to that of the Cauliflower. The Broccoli is a strain of late-maturing Cauliflower and has the property of being hardier in cold countries. The cultivation is the same as that of the Cauliflower. It, however, thrives best in cool locations and on well-tilled, heavily manured, clayey soil. It takes about 5 months to be ready.

BRUSSELS SPROUTS.

(Bud-bearing Cabbage.)

Brassica oleracea Var. Nat. Ord. *Cruciferae*.

This is a tall-growing variety of Cabbage, but, instead of producing a single stocky head, it yields a number of small heads or sprouts on all sides of the tall stem, resembling in colour and texture the Savoy Cabbage. The cultivation is similar to that of the ordinary Cabbage, the seeds being sown on the plains from August to October, and on the hills from February to April.

Sow the seeds in seed-beds and transplant into rows about 2 feet apart, and 15 inches apart in the rows. An ounce of seed will produce about 1,500 to 2,000 plants and about 6 to 8 ounces are required to sow an acre. A well-grown plant usually gives from 50 to 100 sprouts, and takes from 3 to 4 months to be ready.

CABBAGE.

Brassica oleracea capitata. Nat. Ord. *Cruciferae*.

The Cabbage is a hardy biennial plant, indigenous to the sea coasts of many parts of Europe and Western Asia, and is one of the vegetables cultivated from the earliest times. The wild Cabbage, such as it still exists on the coasts of England and France, is a perennial plant and resembles the modern Cabbage only in its flower stems. In most of the Cabbages it is chiefly the leaves that are developed by cultivation; these, for the most part, become imbricated or overlap one another closely, so as to form a more or less compact head, the heart or interior of which is composed of the central undeveloped shoot with adjoined younger leaves. The shape of the head is

spherical, sometimes flattened, sometimes conical. All the varieties which form heads in this way are known by the general name of Cabbages, while other kinds with large branching leaves, which never form heads, are distinguished by the name Borecole or Kale. In some kinds, the flower-stems have been so modified by culture as to become transformed into a thick, fleshy, tender mass; these are known as Cauliflowers and Broccolis. In other kinds, the leaves retain their ordinary dimensions, while the stem or the principal root, has been brought by cultivation to assume the shape of a large ball, as in the case of plants known as Knol-Khol and Turnip-rooted Cabbage or Swedish Turnip.

The best soil for the Cabbage is a rather sandy loam, not less than ten inches deep and perfectly well drained. Sow seeds in well prepared seed-beds rather thinly, sowing them not more than half an inch deep, either broadcast, or in drills which may be about 3 inches apart. When the plants are about 3 or 4 inches high, transplant them in a well prepared and richly manured soil, at a distance of about $1\frac{1}{2}$ to 2 feet apart, in drills 3 feet apart. If the young seedlings are transplanted twice, first at a distance of about 3 to 4 inches apart each way and then in their permanent quarters, the result will be better. As the Cabbage is a grossfeeder, additional nourishment in the shape of liquid manure, or bone dust and guano in equal quantities, given to the plants while growing, greatly helps them to form large and solid heads. The latter may be used at the rate of about 300 to 500 pounds per acre.

On the plains sow from August to December. On the hills from March to August. An ounce of seed will produce about 1,500 to 2,000 plants or about 6 to 8 ounces will sow an acre. Early varieties take about 80 to 100 days to be ready; late varieties 100 to 120 days. From 5,000 to 10,000 heads could be grown on an acre of land, according to the variety and the distance at which they are planted. The average yield per acre is about 10 tons. Cabbage heads should not be allowed to grow fully if required for the table. They are at their best when about three quarters grown.

It is well to remember that the seed-beds should not be as rich as the field into which the Cabbages are transplanted. Do not sow too thick or do not let the plants crowd in their seed-beds lest they come up weak and drawn. Never let them suffer for want of water at any stage of their growth. Do not put down all the seeds at once. It is better to put them down in succession, so as not only to have the heads over a longer period, but to make sure of at least a part of the crop, since there are many insect enemies. These appear at certain times only, and therefore, by division, the planter has a better chance. When transplanting Cabbages, choose a cool, wet day or one immediately after heavy rain, while the ground is wet. If these conditions are not available, transplant late in the afternoon or evening. Quick growing crops, such as Lettuce, Radishes, Beet, etc., may be grown between the rows of Cabbages, and will be out of the way before the Cabbages require the space.

Savoy Cabbage—This is another class of heading Cabbage and is distinguished by its finely netted and wrinkled leaves. It is supposed to be much better in quality than the smooth-leaved varieties. The cultivation is exactly the same as with the ordinary Cabbage.

CHINESE OR CELERY CABBAGE (PE-TSAI.)

Brassica sinensis. Nat. Ord. *Cruciferae*.

Native of China. Annual. Though this plant belongs to the Cabbage family, it resembles a Cos Lettuce in appearance. It forms a long, rather full and compact head, or grows in a plain cluster of half-erect leaves of a light green colour and slightly crumpled or frilled at the edges. The leaves are tender and well-blanchd in the heart. Tying the plants with strings greatly helps to blanch them better. It can be served as salad, like Lettuce, or boiled, minced and seasoned with butter.

The cultivation is the same as with Cabbages, only they may be planted a little closer together. They thrive best in cool weather and take about 60 to 70 days to be ready.

CAPSICUM OR CHILLI. (PEPPER).

Capsicum annum. Nat. Ord. *Solanaceae*.

These are well-known annual and perennial herbs, extensively cultivated throughout India. They are natives of the West Indies, China, Brazil, India and Egypt. There are several distinct varieties, but, as a general rule, the small-fruited kinds are hot and pungent and the large-fruited kinds are very mild-flavoured. The latter are commonly used as a vegetable, cooked somewhat after the manner of Brinjals, stuffed with meat or some vegetables.

The Capsicum thrives best on a light, rich soil, well-tilled and well manured. The small-fruited kinds are hardy in our country and can be grown at almost any time of the year, the best time being from April to June, both on the plains and the hills. Sow the large-fruited, mild-flavoured varieties, from August to September on the plains or even earlier—say in June-July—where the weather is not very hot and the rains not too heavy; and from April to end of May on the hills. The seeds are rather slow in germinating and take about three weeks to come up. They must be sown in well prepared seed-beds and, when about three inches high, carefully transplanted into their permanent quarters in rows about 2 to 2½ feet apart, setting the plants at distances of about 12 to 18 inches apart, according to the variety grown and the nature of the soil.

In some parts of India, Chillies are grown as an unirrigated crop. For this purpose, a black or retentive soil is selected and the seeds are sown in seed-beds and watered by hand or otherwise, till the plants are transplanted into the field which has been thoroughly cultivated and well manured. This is done about the beginning of July, choosing a cloudy or wet day. After-culture consists in weeding and in cultivating three or four times. The fruit ripens about 3 months after transplanting. Picking goes on for 3 to 5 months according to variety and soil. The irrigated fields naturally yield longer and more.

Capsicums of a fairly good size can be easily grown in any kitchen garden with very little trouble on almost any kind of soil, provided it is well prepared and well manured. An ounce of seed will produce a thousand or more plants and about half a pound of seed will sow an acre. Most of the varieties produce green fruits when young which later, as they ripen, change to bright red. A few varieties are bright yellow, violet coloured, black, or yellowish white.

CARDOON.

Cynara Cardunculus. Nat. Ord. *Compositæ*.

This is a perennial plant, native of Southern Europe and Northern Africa, much resembling the Globe Artichoke. In the Cardoon, the leaf-stalks have been developed by cultivation; in the Globe Artichoke, the flower receptacle. It is a larger plant than the Artichoke and grown from seeds only. The seeds are first sown in seed-beds, and when the plants are a few inches high, are transplanted into trenches. The latter may be made about 15 inches wide, the same in depth, and about 4 feet from centre to centre. After having prepared the bottom of the trench to receive the plants by mixing the bottom soil with some manure, set them at a distance of about 18 inches apart and treat them as Celery, drawing the earth close to the stems as they grow and blanching them when they have sufficiently grown, by tying up the plants carefully.

This vegetable is very little known in India but succeeds well in Northern India. On the plains sow during September and October and on the hills during March and April. An ounce of seed will give about 500 plants or a pound is required to sow an acre.

CARROT.

Daucus carota. Nat. Ord. *Umbelliferae*.

This is a hardy biennial, and a native of Europe and the Western Himalayas. The roots of this plant, when artificially developed by cultivation, exhibit the widest differences in shape, size and colour.

Carrots require a good, light, warm soil, deeply tilled and preferably manured a few months beforehand. Other soils will also grow fairly good Carrots but a very stiff heavy clay is not suited to it.

The cultivation of the Carrot is very simple. The seed is sown where the plants are to grow in rows about 10 to 12 inches apart and when the plants come up and are about two inches high, they must be thinned out to distances about 3 to 4 inches apart. The long varieties of Carrot may be planted in drills from 12 to 15 inches apart and should be thinned out to distances of about 6 inches. Carrots for the table should be pulled when about half grown as they are tender then. If the thinnings are judiciously performed and not done all at once, it is possible to pick very small and tender Carrots (as some are likely to be very early), thus making room for others to come on.

On the plains, where the rainfall is not heavy—say, under 30 inches annually—and the weather not hot, sowings could be made even during rains, but the best time to sow is from September to November. On the hills, sow from February to May. During the earlier stages of their growth, the Carrot plants should be carefully watched and no weeds allowed to grow, and they should not be made to suffer for want of water, as they are rather weak when young. By making successional sowings, good Carrots may be obtained for quite a long time. For soils which are naturally not deep, the modern short or stump-rooted varieties are very good.

One ounce of seed will sow a row about 125 feet long, or about 4 to 5 pounds are required per acre. Early sorts are ready for use within 60 to 80 days; late sorts within 100 to 120 days. The average yield per acre is about 10 tons.

CAULIFLOWER.

Brassica oleracea botrytis. Nat. Ord. *Cruciferae*.

In the different varieties of Cabbage known as Cauliflowers, it is the floral organs, or more properly speaking, the flower stems, which have been artificially modified in size and appearance in the course of cultivation. The flowers themselves have, for the most part, been rendered abortive, and the branchlets along which they grow, gaining in thickness what they lose in length, form a sort of corymb with a white, fleece-like surface. These floral branchlets, having become large, white, thick and very tender, produce nothing but a homogeneous mass, and the rudiments of the flowers are only represented by the minute and almost imperceptible prominences, which are found on the upper surface of what is termed "head" of the Cauliflower.

The cultivation of the Cauliflower is on similar lines to that of the Cabbage, though it is not quite so easy to grow. For its best development, the Cauliflower requires a cool, moist season for its growth, a constant supply of soil moisture, and a rich, light, loamy soil heavily fertilised. Thorough and frequent shallow cultivation is essential.

The seeds should be sown in much the same way as Cabbage seeds, and when heads begin to form, the leaves should be brought over and tied around the heads to protect and blanch them. This is not quite necessary, though it will help the plants to produce snow-white heads. The same object may be gained by simply bending one or two leaves over the head, partly breaking them, thus giving some protection from direct sun to the heads.

A top dressing of any good, well-decayed manure, when the plants are growing, considerably benefits them. To be sure of success, see that the plants suffer no check in their whole growth, otherwise they will grow only leaves and will not form a head. The plants should be encouraged to grow rapidly from beginning to end without a check, and still, notwithstanding all care, they will sometimes fail to produce the much-coveted head. This is due perhaps to a little unfavourable weather, too early or too late sowing, or to the selection of the wrong variety.

An ounce of seed will produce more than 2,000 plants, and about six ounces are required to sow an acre. Early varieties take about 90 to 100 days to be ready; late varieties from 100 to 130 days.

Though Cauliflowers of the best quality are grown only from choice and pedigreed seeds grown in Europe, we have in India, some fairly good acclimatised varieties, which have the merit of being hardier in our climate, standing our rains and heat better than the imported sorts. For this reason, the acclimatised varieties are used for the early sowings—from June to August, and the imported from September to the end of October. On the hills, use imported seeds only, sowing from the end of February to the end of April, and again in Autumn.

CELERY.

Apium graveolens. Nat. Ord. *Umbelliferae*.

Native of Europe and the North-West Himalayas. Biennial. The Celery, though not largely grown in India, thrives well almost everywhere, and with care can be grown satisfactorily in this country.

The seeds, which are very small, should be carefully sown in well prepared seed-beds, in drills about 3 to 4 inches apart. They require a partially shady and cool situation and if they come up too thick, should be thinned out, so that the seedlings do not stand closer than about half an inch. The seeds must not be covered with more than about $\frac{1}{3}$ to $\frac{1}{2}$ of an inch. They are usually slow in coming up, taking about 2 to 3 weeks in favourable weather, and 6 to 8 weeks in dry weather. When they are large enough to be easily handled, they must be transplanted to another place, setting the plants at a distance of about 2 to 3 inches each way. When they have grown about 6 inches high, they may be transplanted to their permanent quarters. Any good garden soil is suitable, but they grow best in a rich, friable, well-drained, rather deep soil. While the plants are growing, it is a good plan to cut off a few of the top leaves; this induces stocky growth.

When grown on a small scale, it is good to dig trenches about 15 inches wide, 18 inches deep, and 4 feet apart from centre to centre. A plentiful supply of well-decomposed manure should be introduced into the trenches, mixed with some fine soil to a height of about 6 to 9 inches, over which may be placed some soot, and then the plants may be carefully planted in the centre at a distance of about 6 to 8 inches apart. As they grow, soil may be drawn towards the plants, encouraging the plants to grow straight and not allowing them to spread. This blanching process is to be done slowly, and the final blanching is to be done about a fortnight or so before the plants are required for the table or market. Only the upper portion of the leaves is then visible through the soil.

But when Celery is grown on a large scale, the trenching method is done away with, and the plants are set in rows on the level surface. The rows should be four to five feet apart to permit of securing sufficient soil for banking up, but in all cases the soil should be made as rich as possible to secure a strong and quick growth. To a great extent the attractive appearance, delicate flavour, and crispness of Celery depend on the proper blanching of the stalks. This blanching or whitening of the stalks is the result of excluding light during their growth. Blanching may be done in other ways. When the plants have advanced in growth, the outer leaves should be tied round the inner ones and the soil earthed up round the stalks. Sometimes drain pipes or old-fashioned Indian roof tiles are also used for blanching.

An ounce of seed will produce 5,000 to 6,000 plants in favourable weather, and about 4 to 6 ounces will be sufficient to plant an acre. The seeds should be sown rather thinly in drills as already suggested, one ounce of seed being sufficient for about 150 feet of row. Care should be taken to press down the seeds firmly after sowing, also to press down the soil round the roots of plants after transplanting, so that no hot air can get through the open earth and injure the newly planted seeds or plants. On the plains sow from August to October, and on the hills from February to the end of April. Celery takes about 4 to 5 months to be ready after sowing seeds.

CELERIAC OR TURNIP-ROOTED CELERY.

Apium graveolens Var. *Rapaceum*. Nat. Ord. *Umbelliferae*.

In this kind of Celery it is the root which has been developed by cultivation, to the size of a fist, or even double that size. The leaf-stalks remain hollow and of moderate size.

This vegetable, though very little known in India, can be cultivated successfully, and when well-grown in a cool and moist climate, is very delicious, having a filbert-like flavour. Celeriac is cooked in the same manner as Beet, and requires about the same length of time. The roots are trimmed, washed, and put into boiling water without salt or any flavouring, and are kept boiling until quite tender; they may then be pared, sliced and served with white sauce, or left uncut to be sliced up for salads when cold. It may also be used for flavouring soups, stews or other dishes.

Cultivation is the same as Celery, except that no earthing-up for blanching is required. The seedlings may be transplanted into rows about a foot apart, and 6 to 9 inches from plant to plant.

CHICORY.

Cichorium Intybus. Nat. Ord. *Compositae*.

Native of Europe and several parts of Asia. Perennial. The common Chicory, which is found in almost all parts of Europe in the wild state, has been used from time immemorial for salads, and also as a medicinal plant. The roots, when dried, roasted and pounded, are used for admixture with coffee.

The seeds are sown in drills about one foot apart, in any good, rich, well-worked soil, and the plants thinned out to a distance of about 4 to 6 inches. When the plants are intended to be blanched for salad, they may be thinned out to a distance of 15 inches apart, and when they have attained some size, they may be covered up with an inverted flower-pot for a week or so, which will blanch them.

When the Chicory is stewed and served with melted butter, it bears some resemblance to the Sea Kale. More frequently, however, it is eaten in the same manner as Celery, with cheese. It also makes an excellent and very wholesome salad.

On the plains, sow during September and October; and on the hills from March to May. One ounce of seed will sow a drill about 200 feet long, or 4 pounds will sow an acre. It takes about 3 to 4 months to be ready.

INDIAN CORN OR MAIZE.

Zea mays. Nat. Ord. *Gramineae*.

Native of America. Annual. The Maize is extensively cultivated as a cereal in all parts of India for its grain and also in the garden for its cobs, which when green and tender, are relished by many.

The Maize which is known in America as "Corn", is very extensively cultivated as one of the principal agricultural crops in the U.S.A., and many greatly improved and superior varieties have been introduced during the past few years.

The cultivation of the Maize is very simple. Any ordinary, good garden soil will grow it well. But the best soil is a well-enriched sandy loam. Sow the seeds in rows about 2 to 3 feet apart, putting them at a distance of about 3 to 4 inches in the rows. Cover the seeds about 1 to 2 inches deep, and press down firmly. For a continuous supply, sow in succession every other week. Thin out the plants to a distance of 6 to 9 inches apart, when they are a few inches high. It is a good plan to earth up the plants as they grow, first to a height of about 4 to 5 inches, then later, to about a foot. Water must be supplied plentifully and regularly, and no weeds allowed to grow. To enjoy fresh and tasty corn, one must raise it in one's own garden, as it is said that a few hours after the cobs are removed from the plants, they lose more than half their sweetness. The finest Sweet Corn must be picked in just the right condition, that is, when the skin of the grain breaks at the slightest puncture.

On the plains, sow from April to July, and during May and June on the hills. One pound of seed will sow a row from 300 to 500 feet long, and about 10 to 15 pounds are required to sow an acre. They take from 60 to 90 days to be ready. The average yield per acre is about 5 000 pounds of ears.

The Sweet or Sugar Corns are exceptionally rich in sugar, and are greatly prized wherever grown. The Field Corns are hardier and possess a little less sugar. The Pop Corns are also greatly grown in America. The kernels when brought near heat, pop or turn inside out, become pure white and are very much relished by some people.

Moisture stored in the kernels of Pop Corn is converted into steam **WHY POP CORN** when the Corn is heated, and it is the pressure **POPS** of this steam which causes Pop Corn to pop. Corn will not pop well if it contains too little or too much moisture.

Pop Corn stored where it is in contact with the outside air usually will have the right amount of moisture for popping. If it is too moist, exposure in a heated room or in the sun will dry it out. If it is too dry sprinkle it with water and leave it in a tight container for a day or two, until the moisture is absorbed. Corn pops best when the fire is hot enough to make it begin to pop in about one and a half minutes.

CORN SALAD OR LAMB'S LETTUCE.

Valerianella olitoria. Nat. Ord. *Valerinaceæ*.

Native of Europe. Annual. This vegetable is much used as a Salad in Europe and America and can be easily grown in India.

Sow the seeds in a well prepared bed, and when the seedlings are about an inch or more high, transplant them into rows about a foot apart, putting the plants at distances of 4 to 6 inches. The seeds may be put down where they are to grow and the plants thinned out to the proper distance apart when they have come up. Sow at the same time as the ordinary Lettuce and on the Hills, also in the Autumn. They usually take about 6 to 8 weeks to be ready. An ounce will sow a row about 100 feet long; and about 4 pounds are required to sow an acre. The average height of the plants is about 4 inches only.

CRESS.

Common or Garden Cress : *Lepidium sativum*. Nat. Ord. *Cruciferae*.
American or Upland Cress : *Barbarea praecox*. Nat. Ord. *Cruciferae*.

Water Cress : *Nasturtium officinale*. Nat. Ord. *Cruciferae*.

The Common or Garden Cress is a native of Persia and an

annual. It is a plant of very rapid growth and of extremely easy culture. It can be grown in any ordinary soil, at all times of the year. In the hot months, select a shady and moist place in order to obtain more tender and more abundant leaves. The leaves are used as an ingredient in salad and also as a garnish. As the plants are ready for use in a few days after sowing, successive sowings should be made every 8 or 10 days. They make the best growth during the cooler parts of the year. On the plains the best time is from September to February or earlier—say in June-July—if the weather is not hot and the rainfall not too heavy. On the hills from March to September. Sow the seeds either broadcast or in drills. An ounce will sow a row 100 or more feet long. About 6 pounds are required to sow an acre.

The American or Upland Cress is a native of Europe and a biennial. This plant is a good substitute for the Water Cress which it much resembles, and its cultivation is simpler than that of the Water Cress. On the plains, sow seeds at the commencement of the cold season, in rows about 12 to 15 inches apart, letting the plants stand at a distance of about 6 inches apart in the rows. It is best grown in a cool, rather moist and partially shady situation. In places where rainfall is light, it can be sown during the rains also. On the hills, sow from March to May.

Water Cress.—This is a perennial, and a native of Britain and other parts of Europe. It is an aquatic plant and grows along the margins of running streams, ditches and ponds, and on account of its pleasant and pungent flavour, and its well-known hygienic properties, is highly esteemed for table use. Where a running stream is not available, it can be grown along the sides of a water channel where well water is used. The seeds are started by sowing them rather thinly in ordinary seed-beds, by the side of the water channel and are so arranged that water can be made to run through the beds as required. When the seeds are sown, keep them just wet, and do not flood, until the plants are able to take water about 1 to 2 inches deep, without appearing over-submerged. As the plants will not thrive in stagnant water, fresh water should be taken into the beds as frequently as possible and kept flowing for some time. When required only for a small kitchen garden, it can be successfully grown in pots in partial shade and watered profusely three times a day. An ounce of seed will give at least 500 plants, and 2 to 3 pounds are required to sow an acre. If the seeds come up too thick, thin out the plants about 6 inches apart each way. When once established, they grow very quickly and spread rapidly. Water Cress can also be propagated by cuttings where they are obtainable.

CUCUMBER.

Cucumis sativus. Nat. Ord. *Cucurbitaceæ.*

Native of the East Indies. Annual. It is a plant of easy culture, several varieties of it are grown largely in every part of the country. It will grow in any ordinary good garden soil, with a fair amount of manure added to it. The best soil for it is a warm, rich, sandy loam. Sometimes the plants do not set fruits and the flowers die without producing fruits. In such cases the plants should be helped to set fruits by artificial pollination as suggested for Musk Melons.

Sometimes young plants are attacked by beetles. As a protection, dust the seedlings with fine tobacco dust as soon as they come up.

Air-slaked lime mixed with ashes is also effective, but should be carefully used, for if too strong, it will injure the plants. This application should be repeated every few days in localities infested with the beetle.

On the plains, sow seeds from April to June, and again from October to December. On the hills, from March to June. Sow the seeds in hills (holes), at a distance of about four feet apart each way, putting an extra shovelful of well-rotted manure in each hill. Plant 8 to 10 seeds in each hill, and when the plants are well up, allow only three of the best to remain and pull out the rest. An ounce contains about 800 to 1,000 seeds; 2 to 3 pounds of seeds are required to sow an acre. They take about 50 to 70 days to be ready. The average yield per acre is about 24,000 pounds.

EGG PLANT OR BRINJAL.

Solanum esculentum. Nat. Ord. *Solanaceæ*.

A native of India and North Africa. Though a perennial, it is cultivated as an annual. It is very largely grown in India and many other tropical countries, where it is one of the principal vegetables.

The best soil for the Brinjal is a rich, warm, light or sandy loam, well manured and deeply tilled. The seeds are first sown in seed-beds, and when the plants are large enough to be handled, they are planted out in the ground, in rows about 3 feet apart and 2 feet from plant to plant. As the plants grow, cultivate the ground frequently, keeping it free from weeds and feeding the plants with liquid manure occasionally. Being purely tropical, it cannot stand any frost.

On the plains of Central and Southern India, where the rainfall is light, sow at the beginning of the rains, and also from September to November. In Northern India, the seeds can be sown three times a year, in February, July and October. Thus a very long season of sowing allows the fruit to be had almost throughout the year. On the hills, sow from the end of March to the end of May. An ounce of seed will produce at least 1,000 plants and about 5,000 plants are required for an acre. They produce an average of 4 to 5 fruits to a plant, some-times as many as 10. They take from 120 to 160 days to be ready. The average yield per acre is about 20,000 pounds. The Brinjal is a gross feeder; not less than 20 tons or about 40 cart loads of farm yard manure (well-decomposed cattle dung) should be given per acre. In addition to above, about 1000 lbs. of mixed 7 chemical fertilizer of 5 parts of nitrogen, 8 parts of phosphoric acid and of potash by weight. Another mixture which gives excellent results is 1500 lbs. of castor-oil cake and 550 lbs. of crude saltpetre per acre, where cheaply available.

Fish guano, where it can be had cheap, is also a good manure and yields excellent results.

ENDIVE.

Cichorium Endivia. Nat. Ord. *Compositæ*.

Native of the East Indies. Annual and biennial. The leaves of this quick-growing plant are eaten boiled or as a salad when blanched. Sow the seeds either in seed-beds or directly in the ground where they are to grow. Any good, fairly rich soil, will suit them. When the plants come up, set them in rows 1½ feet apart, and about 9 inches from plant to plant. If sown direct, thin out to the above distance. For blanching, draw the leaves together and tie them up, so as to exclude light from the heart of the plants, or cover the plants with inverted flower-pots, so adjusted that some air goes

through the bottom. Blanching should be done on plants which are nearly fully grown, and it takes about 10 to 15 days. In watering, care should be taken that no water reaches the heart of the plants or they will rot. The Endive when properly grown and carefully blanched, is one of the best salad plants.

On the plains, sow from September to November or earlier—say in June-July—if the weather is not hot and the rainfall not too heavy; and on hills, from March to June and again in the autumn. An ounce of seed will sow a drill about 100 to 150 feet long; and about 3 to 4 pounds will sow an acre. It takes about 2 months to be ready.

KNOL KHOL OR KOHL RABI.

Brassica oleracea Caulo-rapa. Nat. Ord. *Cruciferae*.

This plant belongs to the Cabbage family as already explained under the heading of Cabbage.

Cultivation is similar to the Cabbage, but as the plants require less room, they should be put down closer—say in rows about $1\frac{1}{2}$ feet apart and about a foot apart in the rows. The seeds are either first sown in seed-beds and then transplanted or are sown direct where they are to grow. Thin them after they come up, at the proper distance apart, when they have made a few leaves. They are at their best when they are quite young and tender, when about 2 inches in diameter, and sowings therefore may be made frequently to ensure a longer supply.

Sowings may be made at the same time as Cabbage or earlier—say in June-July—if the weather is not hot and the rainfall not too heavy. An ounce will produce about 1,500 plants, or when seeds are sown by the hand in drills, an ounce will sow about 300 feet of drill. About $1\frac{1}{2}$ to 2 pounds will sow an acre. They take from 65 to 85 days to be ready for the table after sowing the seeds. The average yield per acre is about 25,000 pounds.

LADY'S FINGERS (GOMBO OR OKRA.)

Hibiscus esculentus. Nat. Ord. *Malvaceae*.

According to some writers, it is a native of Africa, where it was cultivated for several centuries before the discovery of America. According to others, it is a native of South America and the West Indies. It is a tropical or sub-tropical plant of an annual duration. This vegetable is very extensively grown in India and other warm countries. It is an erect-growing plant, from 2 to over 3 feet in height, and producing seed pods which when young and tender, are extensively used for eating, either cooked or in soups.

Its cultivation is very simple. The soil and fertilizer-requirements of Okra are similar to those for Cotton. The crop will do well on soils ranging from sand to clay, so long as they are well drained, fertile and well supplied with organic matter. The best results, however, are produced on a friable, highly manured loam. If a side-dressing of some quickly-available nitrogenous fertilizer is applied once or twice when the plants are growing, it will have a very stimulating effect on the plants.

The seeds may either be sown direct in the ground where they are to grow, or transplanted from their seedling beds. The first method is preferable. Sow them in drills about 3 feet apart and 1 foot from plant to plant. The seeds of the better, imported varieties are rather tender and cannot stand too wet or cold soils, and often fail to germinate satisfactorily or at all. The seeds should be sown from 1 to 2 inches deep. If the seeds are soaked in water for about 48 hours, or

until the seed-coat splits, a higher percentage of germination can be secured, as the seeds have a hard coat and are benefited by immersion in water. But then they must be sown immediately after, otherwise they are liable to die.

On the plains, sow from May to December ; and on the Hills from April to June. In Northern India, on the plains, the seeds are generally sown only from May to July. One ounce of seed contains about 400 seeds. Six to 8 pounds of seeds are required to plant an acre. They take about 2 months or a little more to be ready for the table. If the pods are not allowed to mature on the plants and form seeds, the plants will bear pods for a longer period.

The yield of Okra is extremely variable. The time of planting, the variety used, the amount of culture and fertilizer used, the fertility of the land and the amount of rain during the growing season are contributing factors. When pods are cut while young, for table use, and not allowed to mature on the plants, a single stem will produce from 25 to 40 pods in one season. From 5000 to 8000 lbs., can be expected from an acre of land, under favourable conditions.

Dried Okra seeds are sometimes roasted and used as a coffee substitute.

LEEK.

Allium porrum. Nat. Ord. *Liliaceæ.*

A native of Switzerland. Biennial. It is cultivated for the fleshy stem, which when blanched forms an esteemed flavouring ingredient in soups and stews. It succeeds fairly well in this country under proper treatment.

The Leek may be said to be a cousin of the Onion, to which it is very similar in flavour. While the Onion grows best on dry lands, the Leek flourishes where there is more moisture. The seeds may be sown in seed-beds, and the plants set out in their permanent quarters when about 5 or 6 inches high, in drills about 15 inches apart, and 6 to 9 inches from plant to plant. The Leek is a gross feeder and should be given the richest soil or the best manure. As the plants grow, draw the soil near the stems so that a greater portion of the stem is covered and thus blanched.

On the plains, where the rainfall is light—that is, not over 35 inches or so—sow from July to October. Where heavy, sow when the rains are nearly over. On the hills, from March to May. One ounce of seed will sow a row 100 feet long, and 4 to 5 pounds will sow an acre. They take about three months to be ready, though may be left in the ground much longer.

LETTUCE.

Lactuca sativa. Nat. Ord. *Compositæ.*

The native home of this succulent annual is doubtful, but some think it to be Central Asia or India.

It is grown for the stocky head of leaves which it possesses. The latter, when crisp and tender, are universally considered to form the best salad material we have. There are two distinct classes of this vegetable—the Cabbage Lettuce and the Cos Lettuce, with further sub-divisions of both. The former class produces more or less a compact, globular head of leaves resembling the ordinary Cabbage, and the latter an oblong or conical head, formed of narrower leaves which are somewhat spoon-shaped.

Its cultivation is quite simple. To give the best results, the plants must naturally be grown rapidly and without a check, and so a rich fibrous loam or a good garden soil should be selected and heavily manured. The seeds may be sown in seed-beds, and transplanted when large enough to be handled; or they may be sown direct in the ground where they are to grow. Make drills about half an inch deep and about 15 inches apart. Sow the seeds at the rate of about 25 to 50 to the running foot, covering them and pressing them firmly. When the young plants come up, they should be thinned to stand about an inch apart, and when these begin to crowd, every alternate plant should be removed for use. These, though very small, will be very delicate in flavour. The remaining plants, as they grow, should be again thinned out gradually. Heading varieties may be encouraged to form a head, by bringing the leaves together and tying them with a light string. This, of course, is not always necessary, as under proper conditions, the plants head naturally. The best heads are produced in a cool climate and in good soil. Watering must be done freely and copiously whenever needed; merely moistening the surface soil will not do. If the weather be hot, it is good to protect the plants from direct sun.

On the plains, sow from August to December, even earlier if the rainfall is not heavy and the weather not very hot. On the hills from March to the middle of June. An ounce of seed will produce from 2,000 to 3,000 plants. A quarter of an ounce of seed will sow about a hundred feet of drill, and about three pounds are required to sow an acre. The average yield per acre is about 15,000 pounds. As the plants do not take up much room and are ready within 40 to 60 days, they may be planted between Cabbages or other late growing crops.

MUSK MELON.

Cucumis Melo. Nat. Ord. *Cucurbitaceæ.*

A native of Central Asia. Annual. This plant has been in cultivation from time immemorial, and is extensively grown in tropical countries.

In the southern part of U. S. A., where the tropical nature of the country allows the Melon and Water Melon to be easily grown, this deservedly popular fruit is very extensively grown, and thousands of acres are devoted every year to its cultivation. The world is indebted to American growers and hybridisers who have introduced many noteworthy varieties and have improved them greatly, giving more sweetness and flavour to the fruits, making the skin thinner, and the edible portion thicker, and in fixing these and other desirable qualities to the several varieties. Until they are actually tried, one cannot realise to what extent the modern plant breeder has transformed them.

Melons can be easily grown in light, sandy soil, heavily manured, the best soil being that of a dry river bed. If a sandy soil is not available, they can be grown with a little trouble, in any ordinary garden soil, by preparing it very thoroughly, and mixing it with a large quantity of manure containing straw and leaf mould, with an addition of fine sand if the soil is inclined to be heavy.

The Melon is a monoecious plant ; that is, male and female flowers, distinct from each other, are produced on the same plant. Insects, bees, etc., usually visit the flowers in great numbers, and are generally effectual in ensuring their fertilisation. But sometimes the plants do not set fruit ; the flowers open and die without setting fruits. In such cases, it is better to fertilise the flowers artificially, by applying the pollen (yellowish powdery substance on the male flower) with a camel-hair brush to the stigma of the female flower. The female flower is situated on the top of the ovary which is ovoid at the time when the flower expands, and is generally as big as a hazel-nut or even larger.

On the plains, sow from January to March, and on the hills from April to the end of May. Prepare holes five or six feet apart each way, a foot deep and a foot or more wide, in which an additional shovelful of manure is added and thoroughly mixed with the prepared soil. The holes (or "hills" as they are generally called, as after the seeds are sown and covered with soil and the plants grow, the soil rises a little above the surrounding surface) should be only half filled, then put about 5 or 6 seeds in each, covering them with about an inch of soil. When the plants come up and begin to grow, more soil and manure should be put in, so that the stems of the growing plants are covered, and the holes are entirely filled up. Thus the roots of the plants are about three-quarters to a foot deep from the surface when the plants are fully grown. When growing on a larger scale, straight furrows may be made by a plough, about 9 inches deep, and at a distance of about 5 or 6 feet, and the seeds put in the bottom of the furrow dropping 5 or 6 seeds every six feet apart, covering them about an inch deep. As the plants grow, soil should be drawn towards the stems, so as to completely fill up the furrows. Thus the roots of the plants will be deep into the soil where they can be cool and can draw all the moisture they want.

When the plants have come up and have made some growth, thin them out, leaving only 2 of the healthiest plants to each hill. Keep the soil about the young vines, as well as the soil between the hills, constantly loose and fine by frequent workings. Water freely and copiously whenever needed. Many fruits should not be allowed to set on one plant, and only a few selected ones allowed to mature. If the growing point of the plant is stopped by pinching it off when the plant has made a few leaves, it will throw out side-shoots and become bushy ; then the side-shoots will each produce one or two fruits, but only one fruit should be allowed to each side-shoot. This system of pruning is not always necessary as many plants will naturally branch out early.

Cucumbers and Melons should not be grown near to each other, as they belong to the same plant family and adversely affect the fruits of each other.

It is not always easy to know when Melons are ready to be picked from the vines. As the fruits start to ripen, the stem joining the fruit to the vine, cracks away slightly from the fruit, and a small drop or two of reddish juice frequently appears around the edges of this crack. This is a sign that the fruit is almost ripe, and may be removed from the plant. Another sign of ripeness is that the fruit comes off readily, and is easily separated from the stem by a slight twist. If it

adheres firmly, the fruit is not sufficiently ripe to pick. There are other indications of ripeness also, such as the changing colour of the skin or the development of the netting on the skin of the fruit in some varieties and the fragrance which the fruits emit when they reach maturity.

An ounce of seed will sow about 60 hills, and about 2 pounds will sow an acre. They take about 70 to 90 days to be ready. The average yield per acre is about 10,000 pounds.

WATER MELON.

Citrullus vulgaris. Nat. Ord. *Cucurbitaceæ*.

A native of Africa. Annual.

The Water Melon vine makes quite a strong growth, and must have ample room in which to grow and spread.

Cultivation is very similar to the Musk Melon, the same season of growing and the same kind of soil are needed, but the seeds are planted at much greater distances than Musk Melon, giving them at least about 50 per cent. more space. After the plants have made some growth, they should be thinned out, leaving only one healthy plant to each hill. When the fruits appear, not more than one or two should be allowed to mature on each plant if large fruits are required; the rest should be carefully removed as soon as set. If the vines do not set fruit, hand-fertilise them as recommended in the case of the Musk Melon. If the growing fruits be protected by a covering of leaves, they will not get sun-burnt, as they sometimes do.

It is rather difficult to determine when to pick the fruits as they ripen. The method is different from that of Musk Melons. One of the best indications of ripening is in the small tendril, where the stem of the fruit is attached to the vine; while the fruit is still growing, this small tendril remains fresh and green, but as the fruit ripens, it turns brown and dies, giving a good indication as to the ripening of the Melon. Another good sign of ripening is that the white or uncoloured portion of the skin, where the fruit is in contact with the ground, takes on a creamy or yellowish tinge; this is not a very desirable guide, however, as the fruit has to be turned over to be examined. Experienced growers go chiefly by the sound the fruit produces when struck sharply with the fingers; the green fruit sounds solid while the ripe one gives a slightly hollow sound. Another test is to place the hand on the top of the fruit and to lean considerable weight on it; if ripe or nearly ripe, the Melon will "give" slightly under this pressure, and if quite ripe the flesh may be heard to crack slightly. In hot weather, the fruits should be cut from the vines as soon as ripe and placed in a cool, dark room for a day or two, as they become sweeter if treated in this way. The average yield per acre is about 16,000 pounds.

MUSTARD.

Sinapis. Nat. Ord. *Cruciferae*.

Annual. Native of Europe and Western Asia.

The cultivation of the Mustard is very simple. It thrives best in a rich, moist soil but can be grown in almost any soil. Sow seeds broadcast in boxes or in drills about a foot apart, putting the seeds rather

close together. It is a very quick-growing plant, and can be cut within a few days of sowing. Sow seeds every 8 or 10 days to keep up a succession.

On the plains, the Mustard can be sown the year round. On the hills, sow from March to September. In very hot weather, sow under shade of trees, etc., to ensure a quick growth. The leaves, for use as salad should be cut when young. When they grow old or the plants begin to flower, the leaves become too strong-flavoured. In no case should the plants be allowed to run to seed. Big leaves are used as "greens," like Spinach. An ounce of seed will sow 100 feet of row

We give below an American method of preparing and eating Mustard, which we trust will interest our readers :—

"To best appreciate Mustard as a salad, prepare it as follows :—Gather within a few minutes of meal times ; wash if necessary, using plenty of water in a deep pan. Shake out all water possible ; throw upon a towel to quickly remove still more of the water ; serve at once. Eaten just as they are, with salt, bread, and butter, is perhaps the best way to enjoy all piquant salads. But since many people like salad dressings, make such for two persons as follows :—Place half a tea-spoonful of salt, a pinch of white pepper, and three table-spoonsful of the best olive oil in a saucer or bowl, and stir, adding *drop by drop* a tea-spoonful of lemon juice or vinegar, the former preferred. When thoroughly mixed, pour over the salad, mix up well and serve *at once*. Time, a couple of minutes. Do not use too much seasoning

"For the benefit of those who have not used Mustard greens, the following recipe is given ; it will be found general enough for all greens. Have the greens fresh from the garden and cleaned thoroughly. Have a large kettle filled with boiling water, to which add about one tea-spoonful of salt for each gallon of water. When the water boils violently, add the greens and keep the water at a galloping boil for six to ten minutes, according to the texture of the greens used, tender ones a shorter time than tough ones. Since covering the kettle holds in the steam and this dulls the colour, keep the lid off and push down the greens as they rise. Turn the cooked greens into a colander or a pan, the first preferred, and wash thoroughly and quickly in cold water. This will help to restore the brilliancy of colour. Drain well, pressing out all the water possible. Cut or chop fine and season well with salt and pepper. Reheat in a little butter, olive oil, or cream sauce and serve."

ONION.

Allium cepa. Nat. Ord. *Liliaceæ*.

This is a hardy biennial, supposed to be a native of Central or Western Asia. It is one of the oldest vegetables known ; also one of the most extensively used. It not only contains considerable nutriment and has valuable medical properties, but is most useful in counteracting the bad effects of sedentary life. The disagreeable odour it imparts to the breath may be avoided in a great measure by thorough cooking, or by eating a few leaves of Parsley.

The Onion will grow well in a rich, friable, well-manured soil which is not too heavy. The bed or field should be prepared very carefully, the soil worked to a loose, fine condition and made quite

rich with well-rotted manure, poultry droppings if available, and wood-ashes. The seeds may be either sown direct where they are to grow, in rows about a foot apart, and the seedlings thinned out to a distance of about 3 to 4 inches; or they may be transplanted from the seed-beds, into their permanent quarters at the above distances. When seeds are sown, the drills may be made about half an inch deep and the seeds covered to about the same depth and firmly pressed down with a board or light roller.

The ground should be frequently stirred and watered copiously whenever necessary. No weeds should be allowed to grow and when the plants have half grown, a top-dressing of manure or wood-ashes will be found very beneficial.

On the plains, sow from August to November; and on the hills, from February to June. An ounce of seed will sow about 150 feet of drill; and 4 to 5 pounds will sow an acre. They take about 5 to 6 months to get ready. The average yield per acre is about 10 tons.

When the plants begin to die down, stop watering and after they are pulled out, expose them to the sun for 2 to 3 days before storing.

PARSLEY.

Apium Petroselinum. Nat. Ord. *Umbelliferae*.

Native of Sardinia. Biennial.

Parsley is grown for its leaves, which are used for garnishing, flavouring, etc. The leaves may be dried crisp, rubbed to powder, and kept in bottles until needed.

It thrives in most kinds of soil, but prefers a rich and somewhat heavy one, and a partially shaded situation. The seeds may be sown in drills about a foot apart and the plants thinned out, first to a distance of three inches, and finally to 6 inches apart. The thinnings may be planted in another bed and will also yield good leaves. As the seeds are slow in coming up, taking from 2 to 4 weeks, it is a good plan to mix the seeds with some round, red Radish seeds which come up quickly. This method helps in determining the exact place where seeds are sown and the beds may then be weeded freely and cultivated freely between the rows and the young radishes will be ready much before Parsley plants will need the place.

On the plains, sow from September to November; but where the rainfall is very light, sowings may be made much earlier—say from June—provided the weather is not hot during these months. On the hills, sow from February to June. An ounce of seed will sow about 150 feet of drill; and 4 to 5 pounds are required to sow an acre.

PARSNIP.

Pastinaca sativa. Nat. Ord. *Umbelliferae*.

Native of Europe. Biennial.

This plant is cultivated for its fleshy roots, which are eaten boiled, and are also used for flavouring soups. They also make an excellent food for horses in places where it is easily and successfully grown. It thrives best in a deep, rich, loamy soil, free from stones, etc. Its cultivation is similar to that of Carrots. The seeds may be sown in

drills about 15 to 18 inches apart, and half an inch deep, and the plants thinned out to a distance of 5 to 6 inches apart in the rows. They are much hardier than Carrots, and in cold localities can stand ordinary frosts and are supposed to be improved by it. The seeds being very short-lived and susceptible to climatic changes, cannot always be depended upon for germination. They often entirely fail to come up in hot weather.

On the plains, sow during October to November; earlier, in localities with cool weather and not much rainfall. On the hills, from March to May. An ounce of seed will sow about 150 feet of drill; and 5 to 6 pounds will sow an acre. They take from 80 to 100 days to get ready. The average yield per acre is about ten tons.

PEAS.

Pisum sativum. Nat. Ord. *Leguminosæ*.

Native of Southern Europe or Western Asia. Annual.

The garden Pea prefers a cool, moist, loamy soil into which the roots can penetrate deeply; but good results can also be had, especially with the dwarf-growing, early sorts, on light soils during the cool months, as these varieties produce pods ready for the table in about 60 to 70 days from planting. The dwarf, early varieties, growing only from 12 to 18 inches in height, are also especially desirable for the small home garden, as they do not require brush (twiggy branches of trees or of bamboos) or trellis to support them and the rows can be planted quite closely together. Where the conditions of soil and climate are favourable, however, the tall-growing, large-podded, late sorts are preferable, as they are much more productive and continue in bearing for a longer period of time. For the general garden, probably the most satisfactory procedure would be to combine some dwarf sorts for early use, and taller ones for a late supply.

The Garden Pea has received so much careful attention from enthusiastic specialists and plant breeders during the past ten or fifteen years, that we have now wrinkled as well as round-seeded Peas for the earliest supply. These have lost none of the true marrowfat flavour, while the size of both the pods and seeds is greatly increased without sacrificing flavour.

The Garden Pea is a cool-weather plant and does not grow well during the intense heat of summer. Usually the best results are obtained by early sowings, although they may be sown late—much depends on the intensity of the heat during the growing season. The soil should be ploughed or dug pretty deep, and tolerably well supplied with well-decayed stable manure, worked as low down as possible. If a little bone-meal is mixed with the manure, at the rate of a pound for every four square yards, it will greatly benefit the crop. It must always be borne in mind that the deeper the rooting process, the greater the prospects of success. If the ground has been heavily manured for a previous crop, so much the better; then too much manure should not be used again. Two or three successive sowings at intervals of a fortnight each, ensure a longer supply.

Sow the dwarf-growing sorts in single rows about 12 to 18 inches apart, covering the seeds about 2 to 3 inches deep, if the soil is not too heavy. If heavy, cover the seeds less—about 1 to 1½ inches deep—sowing

the seeds at the rate of about 8 to 10 to the foot. The rows of the semi-dwarf and tall varieties, may be from two to four feet apart, according to the height of the variety grown and the strength of the soil. When grown on a large scale in the field, the vines are not supported but are allowed to run on the ground. In this case, the growing vines are pinched off at the top, just after the fifth or sixth flower, after which the vines become more bushy. But in the kitchen garden, all tall varieties should be supported by branches of trees or thin, light, well-branched bamboos, or some kind of trellis.

In the small home garden, where a neat and attractive effect is valued as much as the material produce of the garden, a very satisfactory trellis can be made by using stakes about two inches square, which are sharpened at one end and firmly set in or alongside the row, four feet apart, running with the row. To these stakes, light wire fencing with a two-inch mesh is attached with small staples, which make a most satisfactory support for the large, late Garden Peas, as well as for the more ornamental Sweet Peas, Climbing Nasturtiums, Morning Glories, etc., and also for Lima Beans. The Pea vine twists in and out of the woven meshes of the wire netting, and is also attached by the leaf tendrils, so that where the stakes are firmly set, there is no chance of the vines being blown down. As this wire netting comes in different widths, a trellis of any needed height can be readily made. This support is quite durable and can be taken up after the Peas have finished bearing. It can be cleaned and rolled up, either by detaching the wire or leaving it fast to the stakes, and can be stored away for use next season.

The method of planting the Peas in double rows is practised by many, as one trellis can support two rows. In this case, the rows are about 9 inches apart for the dwarf sorts, leaving about 2 to 2½ feet between each of the double rows, and in the case of later varieties, the rows may be about a foot apart, leaving a space of four to five feet between each double row. The only after-attention the plants need is regular watering in dry weather, and cultivation of the soil to keep it free from all weeds. It is a good plan to draw the earth near the stems of the plants when they are about a foot high. Thus the roots will be deeper in the cool soil. In localities where the Pea does not thrive well, or where the season is not cool or long enough to allow the Pea to succeed, the following method may be tried with advantage. Peas, as a rule, do not like rank or fresh manure. A highly nitrogenous fertiliser should not be applied immediately before planting the seed, as it is liable to cause an excessive growth of leaves at the expense of pods. Select a plot which had been heavily manured for a previous crop. If this is not available, select the best plot in the garden you have. Make trenches either by a deep working plough or by digging at the right distance apart for putting down the seeds. The trenches may be about a foot and a half to two feet deep and a foot or more wide. Remove the soil from the trench and put it alongside. Then, loosen the soil at the bottom of the trench to a depth of about 6 to 8 inches. On top of this loosened soil, put a layer of 5 to 6 inches of well-rotted manure, and cover it with soil removed from the top, filling upto within 8 to 10 inches of the top. Then flood the trench with water. After two or three days, when the soil is still moist, but not too wet, sow the seeds in the centre of the trench on the top layer of the soil, covering them with about 2 to 3 inches of soil. Do

not water immediately after, but only when the top layer has become dry. As the plants come up and grow, draw the soil near the stems, so that finally the whole trench is nearly filled up. All lumps of manure and clods of soil should be well broken up. If the soil is very heavy or clayey, it is better to mix it with some fine sand, leaf-mould or wood ashes. Plants thus grown, will have their roots deep down in cool soil, will resist drought and heat better, and the manure at the bottom of the trench will always keep the roots attracted to it; thus there will be no roots near the surface to be adversely affected by the heat of the sun. Watering should be done plentifully and whenever required. As soon as the plants are a few inches high, stake them before they begin to fall. Keep the surface soil stirred frequently to a depth of 3 to 4 inches and dust the plants occasionally with flowers of sulphur (which can be obtained from any chemist), to prevent mildew to which the Pea is very susceptible in hot weather. This is best done in the morning. Another thing to observe is early sowing; this ensures the longest cool weather for the plants to grow.

Picking the pods should be commenced as soon as they are filled. No pods should be left on the plants to mature, otherwise the plants will not continue to bear more pods. While gathering the pods, great care should be taken not to injure the plants. It is better to use a pair of scissors for removing the pods from the vines.

Peas are divided and sub-divided into numerous sections according to the smoothness or roughness (wrinkled condition) of the peas when dried, according to their heights, earliness, and the edible or non-edible property of the entire pods. The latter, are called Shelling Peas and the former Edible-podded or Sugar Peas. The Sugar Peas should be picked when the seeds are just forming, and cooked like ordinary kidney beans, and there are dozens of varieties of each.

As a rule, the round-seeded Peas are hardier, they retain their vitality longer, and germinate better than the wrinkled-seeded Peas. The latter, however, possess better flavour and contain more sugary matter. On account of the high percentage of sugary matter in the highly-bred modern Peas, they are very susceptible to cold and wet soils, and often fail to come up satisfactorily, if at all. (See further remarks on this subject in Part I of the Guide, under the heading of "Peas, Beans and Maize.")

On the plains, where the rainfall is light—not over 20 or 25 inches annually, and where the climate is not hot during the rainy months (June, July, August and September)—the Peas could be put down from the middle of June to the end of November. On the hills, from March to May and also in Autumn. One pound of Peas will sow a row about 60 feet long. From 60 to 100 pounds are required to sow an acre. The average yield per acre is about 1,500 pounds of Peas.

As an article of food, Peas are very nutritious, rich in phosphates and alkalies, therefore the plant makes a heavy demand on the soil, constituting what is termed an exhaustive crop. For this reason, and also because it is a very early maturing crop, it is imperative that the land should be well prepared to enable the roots to ramify freely, and rapidly collect the food required by the plant. Unlike the beans, it should not be grown on the same land year after year, but a new site must be allotted to it every year or at least every two years.

PUMPKIN.

Cucurbita maxima. Nat. Ord. *Cucurbitaceæ*.

This is an annual of climbing or trailing habit, and is supposed to be a native of tropical America. It is extensively cultivated throughout India for its fruit, which when cooked and dressed, both in an immature and ripe state, is much esteemed as a vegetable, while some varieties are made into a sweetmeat or preserve. It is also used for feeding cattle in Europe and America. The fruit which is usually of a very large size when mature, keeps for months.

The cultivation of the Pumpkin is very easy, especially if a rich, light, well-manured soil is available. As the plants grow quickly and take up a lot of ground, they should be allowed enough room and the seeds should be sown at a distance of eight or ten feet apart in hills or holes, specially prepared for them, putting 3 or 4 seeds to each hill. Prepare the holes, which may be about 16 to 20 inches deep and as much wide, putting a large layer of rich manure, and covering it with soil or compost, 6 to 8 inches thick. Sow seeds on this top soil covering them about an inch deep. As soon as they come up, sprinkle them with air-slaked lime or land plaster, mixed with dry garden soil or preferably with ashes. Fine tobacco dust can also be used for the same purpose with advantage. This will prevent the ravages of beetles to which this plant is susceptible in many localities.

When the plants have made some growth, thin them out to about 2 plants to each hill, allowing the healthiest plants to stand. Generally, the vines are allowed to run on the ground, but sometimes they are trained over strong trellises or are allowed to run over the roofs of out-houses, etc. When the fruits grow, dry straw may be put underneath them, to prevent them from coming into direct contact with wet soil. They require a lot of water when growing, and it should be freely given whenever required. If large fruits are desired, allow only one, or at most two fruits to each plant. When the fruits are ripe, they should be carefully detached from the vines, allowing a small piece of stem attached to the fruits, which should not be bruised. When kept in a dry, rather warm place, they keep well for months.

On the plains, sow from February to July, and on the hills, from March to June. An ounce of seed will sow from 30 to 50 hills; and about 2 to 4 pounds according to variety, are required to sow an acre. They take about 70 to 80 days to get ready. The average yield per acre is about 8 to 10 tons.

The Pumpkin differs very little from the Squash or Vegetable Marrow, especially what are known as Winter Squashes. The introduction, in recent times, of some improved varieties of the Squash has greatly decreased the cultivation of the Pumpkin in the ordinary home garden. It is not a good plan to grow different plants of the *Cucurbitaceæ* family side by side in the same field, as they are sure to affect each other and deteriorate the quality of the fruits.

How to grow prize Pumpkins—Select a rich piece of ground, make a hole in it, say about 3 to 4 feet across each way, and about a foot or more deep. Fill it up with manure and cover with soil. In the centre of this hole, sink a bottomless keg or bucket for applying water. Plant

the seed in small hills around this large central hill of manure, and about one foot away, so that the young plants may secure a good start before the roots extend into the manure. They should be frequently hoed till well established, and should be thinned out to one in a place, leaving only about 4 to 6 plants around the central hill. Give frequent doses of liquid manure to promote stronger growth. When the young fruits are forming, select one or two of the best on each vine, and remove all the others, so as to throw the entire strength of the plant in the fruits left. If the vines grow too long, pinch them off a yard or more beyond the fruit. Squashes can also be grown similarly to obtain extra large fruits.

RADISH.

Raphanus sativus. Nat. Ord. *Cruciferae*.

Native of China and Southern India. Annual.

The Radish is cultivated for its fleshy roots which are generally eaten raw when young. It thrives best in a light, rich, highly manured soil, and should be sown at frequent intervals to keep up a succession. The round and oval-rooted sorts are very quick in maturing, taking not more than 3 weeks to be ready for pulling in favourable conditions. The long-rooted kinds require a deeper soil and a little longer time to mature.

Prepare the ground thoroughly, mixing it freely with well-decayed manure, taking care not to use fresh manure, and breaking up all lumpy manure and soil clods. A good dressing of nitrate of soda will greatly stimulate growth and insure tender, brittle roots. The seeds may either be sown broadcast or in drills. If broadcasted, use about a hundred seeds to every square foot of ground. The seeds may be covered about half an inch deep and the soil firmed by pressing it down either with a board or by the back of a spade. If in drills, let the drills stand about a foot apart. If the seeds come up too thick, thin out the plants so that they stand at a distance of about 2 inches apart. As they take up but little room and grow very quickly, they could be grown as a secondary crop, between rows of Beets, Knol Khol, Cabbages and other rather late-growing crops.

On the plains, sow from the beginning of the rains to the end of January where rainfall is light, but where heavy, sow when the rainy season is nearly over. On the hills, from March to May. The acclimatised long white variety so extensively grown all over India is hardier, and can be sown much earlier as it stands rains better than other varieties. An ounce of seed will sow a row about 100 feet long; and 8 to 10 pounds will sow an acre. The average yield per acre is about 3 tons.

RHUBARB.

Rheum. Nat. Ord. *Polygonaceae*.

Perennial. Native of Mongolia.

This plant is not much known in India, and very little grown except on hill stations and cool localities. But it is extensively cultivated in Europe and America for its large, thick leaf-stalks, from which delicious tarts and preserves are made. It is also used as a vegetable.

In localities where the Rhubarb is grown, it is generally propagated by division of the roots. It could also be raised from seeds, but the different varieties do not come quite true from seeds and exhibit great diversities of character. In localities where it thrives, its cultivation is simple. For its best development it requires a deep, rich, well-drained soil and a partially sheltered or shady situation. The seeds may be sown in drills about a foot apart, and the plants allowed to stand about 4 to 6 inches apart in the drills. Here they may be allowed to grow for some time until they begin to crowd. Then they may be transplanted into their permanent quarters in a well-manured bed, at a distance of about 3 to 4 feet apart each way. Here the plants are allowed and encouraged to make a good growth for about a year, before the stalks are pulled for use. As the plants will yield for three or four years or even longer, the preparation of the ground should be thorough and deep, and the beds should be top-dressed about twice a year with some good, well-decayed manure. If bone-dust is mixed with the manure, so much the better. No flower stems should be allowed to form seeds, as otherwise they will exhaust the plants.

Rhubarb can also be forced easily. Get large, well-grown roots, not less than two years old, from the open field, and put them upright in a box or barrel as closely as they can be wedged together (with a little soil shaken in to fill the interstices between the roots) under the stage or benches of a green-house or in a warm cellar, when the temperature averages about 60 degrees, with a moderate amount of moisture. Light is not necessary. When the stems are grown in the dark, they are blanched and are more tender.

On the plains, where the rainfall is not heavy, sow during rains. Where heavy, sow when the rains are three-fourths over. On the hills, sow from March to May.

ROSELLE (Red or Indian Sorrel).

Hibiscus Sabdariffa. Nat. Ord. *Malvaceæ*.

Annual. Native of West Indies.

It thrives well in almost every part of India, growing to a height of 3 or 4 feet. The fruit, or rather the large, thick, succulent sepals which enclose it, is pleasantly acid and is used in making tarts, jellies and chutnies. The jelly made from it is considered by many to be superior to Guava jelly and closely resembles Red Currant jelly in taste and flavour. The plant is very ornamental with its large yellow flowers and dark crimson eye. The flowers are followed by red fruits which are set thickly on every branch. One ounce of seed will produce about 600 to 700 plants.

On the plains, where the rainfall is not much over 60 inches annually, sow about the end of May or even a little earlier if the weather is not very hot. In places with heavier rainfall, it is better to sow when the rainy season is three-fourths over. As it takes a long season to mature (about 5 to 6 months), and is very susceptible to severe cold and frosts, it is difficult to grow successfully on the hills of Northern India. But if the seeds are put down early in the Spring after danger of all frost is over, the plants may produce fruits before the cold weather sets in. In the hill stations of Central and Southern India, it can be grown more successfully. The seeds may be sown where they

are to grow, and the plants thinned out to a distance of about 3 feet apart each way. The thinnings may be transplanted to another part of the garden. In Northern India, where the cold weather is severe, it is generally sown much earlier—say during April and May.

SALSIFY OR VEGETABLE OYSTER.

Tragopogon porrifolius. Nat. Ord. *Compositæ*.

Biennial. Native of Great Britain and many other parts of Europe.

This delicious vegetable of which the chief edible part is the root, is far too little known in India. It is as easy to grow as Parsnips or Carrots, and has a distinct and inviting flavour, so much like the oyster, as to earn the name of Oyster-plant, particularly when it is boiled, sliced and fried in butter. It is nutritious and very wholesome. The tender young leaves make a good salad. The root is long and slim, white-fleshed and with a smooth whitish skin. The leaves are grey-green, long, straight and narrow, having a grass-like appearance.

It thrives best in a deep, rich, cool soil which is rather light than heavy, and requires a whole season in which to mature. Plant the seed direct in the ground in drills about a foot apart, covering the seeds about an inch deep, and allowing the plants to stand about 4 to 6 inches apart in the rows after thinning. As the germination of this seed is rather uncertain in dry weather, first test a few seeds, and then if they come up, sow the rest. Otherwise, soak the seeds in water for a few hours and then sow immediately. This usually helps germination. It is fairly hardy in cold countries, and can be left out in the ground with a little protection during the whole winter. Or it may be lifted at frost time and stored like other roots. The yield per acre, under favourable conditions, is 100 to 150 bushels.

On the plains, sow during October or thereabouts. On the hills, from March to the end of May. About 1½ ounces of seed will sow a drill 100 feet long, and about 8 to 10 pounds of seed are required to sow an acre. The roots are ready to be pulled after about 100 days.

As its culinary uses are not much known, we give a few hints :— Wash and scrape 6 or 8 fair-sized roots, then cut into slices about 3 inches long. To prevent them from turning dark put immediately into three pints of water ; add 2 table-spoonful of flour, one tea-spoonful of salt and a few drops of vinegar. Place them on the fire and cook for about half an hour, from the time the water begins to boil. Drain and serve with white sauce ; or mix together and serve with one table-spoonful of salt, one tea-spoonful of lemon juice, one tea-spoonful of minced parsley or chervil. Serve at once. The roots may be boiled like Carrots or Parsnips or half-boiled and grated fine, made into small flat balls, dipped in a batter and fried like oysters to which they are somewhat similar in flavour.

SCORZONERA. (Black Salsify.)

Scorzonera Hispanica. Nat. Ord. *Compositæ*.

Native of Spain. Perennial.

This plant is cultivated as an annual or a biennial. It has a fleshy tap-root, resembling that of the Salsify in size and flavour, but

of black colour. It is grown in exactly the same manner as Salsify. It is much slower in developing its roots, which keeps on growing in size if left in the ground, and is fit to be eaten even after a long period of growth. It has a distinctly palatable flavour, and is said to be good for dyspepsia. The roots are used boiled, and the young leaves make good salad. In preparing for the table, the roots should be washed, not scraped, and boiled until soft, then peeled and served whole.

SPINACH.

Spinacia Oleracea. Nat. Ord. *Chenopodiaceæ*.

Native of North-Western Asia. Annual.

Spain is supposed to be the first European country into which this plant was first introduced. It is a dioecious plant, bearing male and female flowers on different plants, the latter only, yielding the seeds.

It is very quick growing, maturing within two months, and it can be grown between rows of late growing vegetables; the edible part being the leaves which are eaten boiled.

The cultivation of the Spinach is simple, but it grows best in cool weather, and in partially shady places. Quick, rapid growth is desirable with this plant so that the leaves and stems may be tender. It is important to have the soil as rich as possible and in fine tilth.

The seeds should be sown rather close together in drills about a foot apart, as their germination is usually less than average, about an ounce being used for every 100 feet of row, and about 10 to 15 pounds to the acre. After sowing, press down the soil firmly over the seeds, and if they come up too thick, thin them out at once to a distance of 6 to 8 inches as they grow. The soil should be frequently stirred and watered freely in dry weather. Flowering shoots should be nipped off as they appear. If extra fine and rapid growth is desired, use a top-dressing of nitrate of soda at the rate of 150 pounds per acre. This may be given in two applications, about every fortnight, soon after the plants get nicely started. If nitrate of soda is not available, a top-dressing of hen manure or well-rotted barn-yard manure is also beneficial. Plant at intervals of 2 to 3 weeks for a successive crop. On the plains, sow from September to December, even earlier—say in June-July—where the rainfall is moderate and the weather not hot. On the hills, from March to June. The average yield per acre is about 12,000 pounds.

New Zealand Spinach (*Tetragonia Expansa*).—Native of New Zealand. Annual. This plant is quite distinct from the ordinary Spinach, but is an excellent substitute for it in hot weather, and in places where the common or so-called English Spinach is difficult to grow.

The plant is of rapid growth, spreading quickly to a distance of over two to three feet, bearing numerous fleshy leaves, which when well-grown in a partially shady situation are used exactly as ordinary Spinach, the tender tips only being used.

SQUASH OR VEGETABLE MARROW.

Cucurbita Pepo and *C. maxima*. Nat. Ord. *Cucurbitaceæ*.

Native of tropical America. Annual.

These plants which are mostly of trailing habit, belong to the same plant family as the Pumpkin, and require the same treatment of culture

and soil. They are very largely grown in America, and in some parts of Europe. Being tropical, they are easily grown in India, when treated as a summer vegetable.

They are generally divided into two classes : Summer and Winter Squash. The former are generally used when the fruits are immature and about three-quarters grown. They do not keep for any length of time. The latter are used only when they are fully matured, and are very good keepers ; they resemble the Pumpkin in many ways. Some of the Summer Squashes are of the bush type—that is the plants are not trailing but grow compact. These are grown in hills which may be only about 4 feet apart each way, whereas the other varieties of the Summer Squash which are trailing, require at least double the room. The Winter Squashes are mostly of the trailing habit. They also produce fruits with a hard shell or rind, and solid, richly-coloured flesh. They are used for stewing, baking, or making pies like Pumpkins.

It some times happens that apparently healthy plants produce fruits which when very small wither away and die for apparently no reason. The cause is the same as in the case of melons—the plant bears both male and female flowers separately, the latter only bear the fruits. When the female flowers are not pollinated by natural agencies such as bees and other insects, the fruits can not develop. Hand fertilization, as suggested for the musk melons will remedy the defect.

The Summer Squashes being soft-skinned, do not keep long and should be gathered before they are fully matured, and while they are still young and tender. The proper time for gathering the fruits after they have reached good size, is easily ascertained by puncturing the skin of the fruit with the thumb nail. If the skin is too hard to puncture easily, the fruit is too old and should be discarded, and at once removed from the plant, so as to encourage the plant to produce other fruits.

The time of planting, and the quantity of seed required is about the same as for the Pumpkin. But in places where the cold weather is very mild, as in Lower Bengal and some parts of Southern India, it can be sown also in October. But in the United Provinces and the Punjab, the plants will not stand the cold weather, and seeds should not be sown before February.

The same time of sowing is suited to both the Winter and Summer Squashes in our country. The plants and fruits being sensitive to cold, should not be exposed to frost. The Summer Squashes and early varieties, are ready to be picked within eight weeks from the time of sowing the seeds, and the late varieties of the Winter Squash take a much longer period to mature—about 3 to 4 months according to variety, climate and soil. The average yield per acre is about 8 tons.

TOMATO.

Lycopersicum esculentum: *Solanum Lycopersicum*, Nat. Ord. *Solanaceæ*.

Native of South America. Annual.

This well-known and favourite vegetable is very largely and successfully grown in all parts of India. It is a branching plant with a flexible stem, requiring artificial support to grow erect. It is a

plant which grows best in cool localities, though it will not stand very cold weather or frost

In Europe and America, in localities with long winters, the Tomato requires to be started in artificial heat, but here in our country, it is grown very successfully out of doors. The seeds which usually germinate very freely, should preferably be first put down in seed-beds in rows, and when about 2 to 3 inches high, they may be transplanted in their permanent quarters. If the seedlings are transplanted twice before they are finally set out in the garden, they will form stockier and hardier plants and will yield better. They may also be sown broadcast. When sowing, the seeds should not be covered more than half an inch, and about four seeds may be put down to every inch of drill. The Tomato thrives in many kinds of soil, provided that it is well-worked and fertilised. In light, sandy soils, the fruits are inclined to mature earlier than in heavy soils. As the plants take up much room, they are generally put down in rows at least three to four feet apart and about 2 to 3 feet apart from plant to plant in the rows. When grown in the field, the plants are allowed to spread on the ground and are not given any support.

Where only a small number of plants are grown, it is advisable to train them on some support. Use strong stakes about 5 to 6 feet long, and insert one near each plant when about a foot high and tie the plant rather loosely with some soft twine which will not cut into the stem as it thickens. Remove some of the side shoots if they come up too thick, and train the plant on one stem. Or, instead of one long support, use the following plan, which has the merit of being cheap and neat, and could be followed in a small as well as a large garden : Midway between two rows of plants, drive stakes (about 5 to 6 feet long) at any convenient distances, to the top of which a scantling or a bamboo is nailed. Across this scantling tie sticks with the lower ends sunk in the ground ; set the plants at the foot of each stick, and tie them to the sticks as they grow.

Though the Tomato does not require a very rich soil, its chief need is nitrogen in the soil, which can be supplied in various forms. Stable manure which is rich in ammonia which also supplies nitrogen, nitrate of soda, nitrate of potash, dried blood, chicken manure, etc. are all beneficial. The rapidly growing Tomato vine makes heavy demands on the plant food in the soil. As the fruit begins to develop, an added drain is imposed on the available nutrients, with the result that the fruit usually suffers. The addition of nitrogen, in some readily available form at this critical stage, results in a greater percentage of the fruit reaching maturity, hence higher yields. Applications of nitrate of soda or sulphate of ammonia at the rate of 75 to 100 pounds per acre have given excellent results. Larger amounts than above should be avoided as they may over-stimulate vine (leaf) growth. In places where the temperature is usually high, try to give the Tomato plants as good and deep a soil as possible. If the roots of this plant are near the hot dry surface, they do not thrive and many times the plant dies, without any apparent reason. Cultivate the soil as frequently as possible, keeping it free of weeds. It is necessary that the plants are not checked in their growth, especially while they are young, either for want of water, over-crowding in their seedling stage or too poor soil.

On the plains, where the rainfall is not heavy, sow in June-July. Where the rainfall is very heavy, sowing must be delayed till the rains are nearly over. On the Hills, sow from March to May. We have had reports from Erinpura (Rajputana), that the Tomato does better there during the summer and is less liable to diseases, than at other time.

In Northern India where frosts occur, the Tomato plants require a sheltered situation and some protection. For this purpose, the plants are put down rather closer together in sets of two or three rows, allowing a space of $1\frac{1}{2}$ feet between the rows, and about the same distance from plant to plant, and then a space of 3 or 4 feet is allowed between each set of rows as a pathway. When frost is prevalent, or when the nights are exceptionally cold, the plants should be covered every evening with mats or grass tatties, until the weather becomes mild.

Unfortunately the Tomato is subject to several diseases and insects. The Horn Worm which attacks both the Tomato and the Tobacco can be controlled by timely applications of arsenate of lead. It should be sprayed as soon as the worms make their appearance. Several applications may be necessary during a season. Then, there is Blight, a bacterial disease, which produces a wilting of the plants. No remedy is known except to grow wilt-resistant varieties in soil where Tomatoes or allied plants have not previously been grown. The Rot is another disease which first shows itself on the blossom-end of the fruit when about half grown. Three or four applications of the Bordeaux Mixture should be made at intervals of two weeks, making the first application as soon as the fruit begins to set.

An ounce of seed produces over two thousand plants, and about three to four ounces are sufficient to plant an acre. The plants begin to ripen fruit three months after the seeds are sown, yielding good supplies for several weeks in favourable weather. The average yield per acre is about 14,000 pounds. If paper bags are tied over the green fruits, while on the plants, ripening is hastened by a few days.

On the plains sow from June to October. On the hills from March to May.

TURNIP.

Brassica Rapa. Nat. Ord. *Cruciferae*.

Biennial. Native country uncertain.

The Turnip is a very easy crop to grow, the simplest management produces an ample supply.

Any fairly good garden soil will grow good Turnips. To get the best flavoured Turnips, grow quickly in a rich, rather moist, light, sandy soil, which has been well worked.

The seed is sown either broadcast or in drills. The former practice is generally followed on light, sandy soil, the seeds being covered about half an inch deep with fine soil, using about three pounds of seed to the acre. To ensure even distribution of seeds, when sowing broadcast, it is a good plan to mix the seeds with about three or four times their bulk of fine sand or soil, before sowing. When the seedlings come up, they should be thinned out to a distance of about 6 to 9 inches apart. When sown in drills, they should be from 15 to 18 inches apart and thinned out to the

usual distance. On heavy, tenacious soils, it is better to sow in regular rows or on ridges, than broadcast. Sow at intervals of a fortnight each, to keep up a longer supply.

On the plains, sow from September to November, even earlier—say in June-July—in places where rainfall is moderate and the weather not hot. In the Punjab and other places where the weather is hot, sow about the middle of October. On the hills, from March to June and also in Autumn. One ounce of seed will sow a row about 150 feet long. Two to three pounds are required to sow an acre. The early varieties of Turnips are best gathered before they have fully grown, when they are still tender. They take from 6 to 8 weeks to be ready for the table from the time of sowing. The average yield per acre is about 10 tons.

RUTA BUGA, SWEDE, OR RUSSIAN TURNIP.

As already explained under the heading of Cabbage, this is not really a Turnip but a Cabbage with a root like the Turnip, growing partly underground. Cultivation is similar to the Turnip except that the Swede is larger, and requires much more room to grow. It takes about three months to be ready. The average yield per acre is about 12 tons.

PART III

Lawns, Lucerne, Papaya and Hedge.

LAWNS AND GRASS PLOTS.

The lawn furnishes the setting for a house and if it is trim, smooth and of a healthy green, will add to an attractive house, the finishing touch which no amount of planting can give.

Many people seem to have an idea that lawns can only be made in extensive gardens and that they are costly to make and keep. Such, however, is not the case. Even small gardens can have lawns and except for the initial cost and labour of making it, the upkeep charges are negligible.

Most houses have a grass plot or two, but these usually consist of annual grasses and weeds. If, for some reason or other, a permanent Hariali or Doob grass lawn is not wanted, then the existing lawn can be considerably improved by having it constantly weeded, removing all coarse grass and weeds and by manuring, watering, mowing and rolling it occasionally. Bare patches should be hoed, manured and a few grass roots dibbled in. During the rains the appearance of the garden can be considerably improved by keeping the grass plots tidy and neat, at very little expense and trouble.

But if you decide to have a good lawn, it is well to remember that thorough preparation of the ground is very essential and is the foundation on which lawns are built. The formation of the lawn is too often hastily and imperfectly done; it is the foundation of all subsequent operations, and if badly done at first, the fault cannot be easily remedied afterwards.

Dig up the ground to a depth of at least one foot or more if possible and remove all roots of weeds very carefully. If the ground is infested with the Indian Nut Grass (*Cyperus rotundus*) which is a very tenacious weed and is very difficult to eradicate, the ground must be dug up to a depth of about three feet, removing all the weed roots. The earth thus dug out should be well exposed to the sun, and turned over at least two or three times, every time removing the roots of weeds. If the soil contains small pieces of stones etc., it should be sifted through a rough sieve and the ground levelled up. Over this level surface put any old, well-decayed manure, about 3-4 inches thick and spade it in, more or less near the surface—say not more than six inches deep. If, however, the soil be very poor or sandy, it is advisable to remove some of the old soil and put in a goodly layer of rich soil, either from a riverbed or some nearby field.

Good drainage is also essential in maintaining a lawn in good condition. Where only small lawns are made and where the soil is not sticky or clayey, special drainage may not be necessary. But where the plot is a large one—say the size of a tennis court or thereabouts—it is advisable to have surface drains at the ends or sides of the plot, with a proper outlet for the water. These drains should be kept clear throughout the rains, after which, if desired, they may be filled up with earth till the next monsoon.

After having prepared the ground, it should be rolled to make it perfectly level and then very thoroughly watered. If any weeds come up, as some are bound to—usually most manures also contain some weed seeds—they should be carefully destroyed. If time permits, it is well to rake up the surface soil again and after levelling and rolling it, it may be watered again a second time and weeds destroyed if any come up.

The old method of using Hariali or Doob grass to make a lawn is now superseded by the easier method of sowing seeds of the above grass,

which gives a perfect and lasting lawn within a short time. Before sowing, the seeds should be mixed with about double its bulk of fine sifted soil, broadcasted carefully with hand, and lightly raked in.

While sowing seeds, it is well to measure off the plot into squares with string, and plant out one square at a time; this ensures uniformity in planting. Pass a light roller over the ground and water thoroughly. The Hariali seed is rather slow to come up and usually takes about 3 weeks before it makes its appearance and sometimes as long as 4 to 6 weeks. Sow seeds at the rate of about a pound to every 300 to 400 square yards, or 12 to 15 lbs. to the acre.

After a few weeks, the grass should be fit for cutting. Before cutting it with a mower, it is advisable to cut the grass with a pair of sharp garden shears so that when the mowing machine is used, it will go over a more or less even and low growth. The ordinary lawn mower is not expected to cut tall or uneven grass. Before mowing, the roller should go over the grass to make it firm. Thereafter, the hand-cutting will not be at all necessary, as every few days the lawn should be rolled and the mower worked over it.

If the seeds have not come up evenly and the grass is thin or sparse in some places, a little raking and re-seeding will fill them up. If any portion of the lawn has sunk, sprinkle thin layers of good earth on the depression, not more than an inch thick at a time, to bring it to the level, so that the grass may not be covered up or injured by too deep a covering of earth.

Watering must be thorough and as frequent as weather conditions require. It is not necessary to flood the lawn as the doob grass is not a very deep-rooting plant and too much watering is likely to encourage other deep-rooting weeds. In very dry weather, daily watering may be necessary, but otherwise watering should be given every two or three days. A rubber-hose attached to a municipal water-pipe is a very efficient way of watering and is preferable to water-cans or buckets. If water-sprinklers which distribute water evenly over a good surface at a time, are used, much of the mali's time will be saved. Then it is only necessary to shift the position of the sprinkler from time to time till the whole surface is covered. But for this purpose there must be sufficient pressure in the water-pipe.

A good lawn cannot thrive in the shade. Constant weeding, watering, rolling, mowing and occasional manuring will ensure a perfect lawn. To stimulate the growth of grass apply liquid manure made from cow or horse dung. Avoid farm-yard or other ordinary manures as a top-dressing, as usually they contain weed seeds. Nitrate of Soda or sulphate of ammonia, diluted in water (an ounce in every two gallons) and given occasionally, is a wonderful stimulant. A top-dressing of finely sifted leaf-mould 6 parts, fine sand 12 parts and bone meal 1 part, given every six months is also excellent.

Dew which we generally experience during the cold weather, is a great help to growing grasses and it is advisable to take the full benefit of it, by brushing it into the lawn either with a light bamboo switch or rolled in with a light wooden roller. The former is preferable.

During the rains, no stagnant water should be allowed to remain on the lawn, or it will kill the grass, leaving bare patches. If the ground appears to be sodden, and a green slime-like substance forms at the roots of the doob, a sprinkling of crushed lime-stone will sweeten the soil and get rid of the wet patches. The constant rolling, mowing and watering sometimes cause the compacting of the surface, preventing

subsoil water from rising. This is especially the case where there is more rolling and less watering. In such cases, a light top-dressing of rather coarse sand is recommended. It prevents the formation of surface-crust and is otherwise beneficial to grass growth.

LUCERNE OR ALFALFA.

(*Medicago sativa.*)

One of the most valuable leguminous forage crops cultivated in India. It is rightly called the King of fodder plants as it gives a continual harvest without an annual ploughing or seeding. Its cultivation is increasing very rapidly in all parts of the world, including the United States of America, Australia and the southern countries of Europe. It is said that this plant has been cultivated by man for over 2000 years. This in itself shows the great value and usefulness of this hardy, long-lived, perennial forage plant. Under Indian conditions, it needs regular irrigation.

Lucerne will grow on nearly all good, well-drained soils, but it thrives best in a deep, friable, loamy soil, with a sub-soil of "morum" or limestone. Even a light, sandy loam which admits of thorough drainage, will grow a good crop. Very deep, black, sticky soil in which drainage is difficult and water is likely to stand for some time, should be avoided. Such black soils as are not very stiff, and have a porous sub-soil at a depth not greater than two to three feet, can be made suitable by a heavy dressing of cattle manure. Calcareous soils are especially suited to it.

Land intended for Lucerne must be thoroughly prepared by deep ploughing and if possible should be allowed to lie fallow for some time and all weeds destroyed. It should be further pulverised and made smooth and fine by carefully breaking up the clods. Farm-yard manure may then be applied at the rate of 30 to 40 cart-loads per acre and completely mixed in the soil by a second ploughing and harrowing.

Lucerne as grown in the Bombay Presidency, is generally planted in square beds laid out for regular irrigation. The size of the beds may be about 10 x 10 feet, and the seed broadcasted. This method yields a good crop at first for some time but, later on, weeding being difficult in such beds, the plantation is run over by weeds and becomes unproductive. The other method which is employed more extensively as its advantages become known, is to sow the seeds on ridges two feet apart. For this method the land must be as level as possible and the ridges should run across the slope, so that the irrigation water may not all run to one end of the ridge. This system admits of frequent hoeing and the plantation yields good crops for a longer period.

The seed is sown broadcast by hand either in beds or on the tops of the ridges, and covered lightly with earth by a hand rake. The best time for sowing is early in the Monsoon or from September to November. About 20-25 lbs. of seeds per acre are required in the bed system and about 15 lbs. in the ridge system. Only the best seeds of good quality which is free from dodder seeds or other impurities, must be sown.

The first few waterings should be at intervals of three days or so, unless there is rain. Subsequent waterings may be given every 8 or 10 days in the cold weather and during breaks in the rains and every six or eight days in the hot weather, according to the nature of the soil.

The plantation must be always kept clear of weeds and a top-dressing of manure should be given, twice or thrice a year. About 5 to 10 cart-loads per acre at a time, are enough. Well-rotted, farm-yard manure is very suitable. Weeding and top-dressing are both difficult operations in the bed system, but the ridge system is favourable to both of them. By frequently working a country plough or an iron hoe or ridger between the ridges, weeds can be kept down and the soil kept in good condition.

The first cutting can usually be taken after about 8 weeks. Care should be taken that the young plants are not uprooted. An established plantation can yield about one cutting every three weeks or so, giving on an average, about 2000 pounds per acre for every cutting, or about 80-90 pounds per day. It is always best to allow the lucerne fodder to dry a little before feeding the cattle.

In districts with heavy rainfall, like, say, the Konkan, a permanent plantation is not possible as the heavy rains destroy the lucerne crop during the monsoon.

Lucerne is good for the land. Like other legumes, it has the power of gathering nitrogen, one of the essential plant-foods, from the air. Its deep-reaching roots bring up fertilizing elements from the sub-soil and place them where they may be utilized for other crops. Thus it can be used as a green manure and, when ploughed under, its leaves, stubble and roots add much humus and nitrogen to the soil, and leave it in an excellent condition for all other crops.

PAPAYA, PAPAÛ OR PAPITA.

Carica papaya. Nat. Ord. *Passifloreæ*.

The Papaya is a large, succulent, rapidly-growing tree, and is supposed to be native to Tropical South America and the West Indies. It has become thoroughly naturalised in Ceylon and in India where it is successfully grown everywhere on the plains. On the hills, it cannot be grown successfully except in the South, and that too only upto an elevation of about 4000 feet. It is also largely grown and much appreciated in the Hawaiian and Phillipine Islands and also in Brazil. It is also grown on a commercial scale in South Florida and in some parts of California, U. S. A.

It grows to a height of 10 to 20 ft. usually on a single straight stem, with beautiful, large, palm-like leaves symmetrically distributed at the top, giving the tree, a beautiful, palm-like appearance. It is so easily grown, produces wholesome fruits in such abundance, is so free from diseases or insect-pests, occupies so little space, that it should be grown in every garden, large or small. The papaya is usually propagated from seeds which should be saved from selected fruits grown on healthy trees. It is also propagated from cuttings of side-shoots and by grafting; but these methods are very rarely employed.

It differs from most trees in its flowering habit. Some trees produce only pistillate or female flowers, others develop only male or staminate flowers, while a few have perfect flowers. The male tree does not produce fruits and so should be removed as soon as found. Its first flowers which are sweet-smelling and numerous, appear when the tree is only a few months old and are carried on long pendulous stalks. The flower of the female tree is longer than that of the male but has a very short stalk and may be easily recognised by the globular ovary in the centre. As the female tree does not set fruit freely without some male

flowers, it is advisable to have at least one male to every hundred female trees. Experiments conducted in the Montgomery district of the Punjab, by the Government Agricultural Department show that a plantation of exclusively female trees produced fruits without seeds. No male trees were allowed to grow for miles around. But it is generally believed that the presence of male trees conduces to the increase of the size and number of fruits.

As the Papaya has a tap root, it is rather difficult to transplant. This, however, can be done successfully if care is used. While transplanting, the seedlings should not be set too deep, otherwise they are likely to rot. A deep, rich soil, either red or black is suitable. It grows best in a hot, moist climate, but will also grow in drier climate if properly watered. When grown on a large scale, the land should be twice ploughed and harrowed. Farm-yard or stable manure may be used liberally as it is a gross feeder. About 40 to 50 cart-loads will be sufficient for an acre. If the soil be rich and well manured, it will not be found necessary to give additional manure the first year. But at the end of 10 or 12 months when the trees will come into bearing, some additional manure may be profitably given, by digging it in, near the roots. The manure given may be either a mixture of animal manure and wood-ashes, using about 15 lbs. to each tree. The following manure may also be profitably given : Castor cake, Nitrate of Soda, bone meal and wood-ashes in equal parts, giving about $1\frac{1}{2}$ pounds to each tree. Care should be taken that this fertilizer does not come in direct contact with the roots. After the fertilizer is applied, it may be found necessary for some time, to give water more freely and at shorter intervals.

The usual distance from tree to tree is about 8 ft. which gives about 700 trees to the acre. Holes may be made about $3' \times 3' \times 2'$, filled up with good soil mixed with manure. This, however, is not quite necessary if the soil is fairly deep, well enriched and well cultivated. Three or four seeds may be sown in each hole. When the seeds come up—which they would do within two to three weeks—remove all but two plants. Or the seedlings may be transplanted from their beds into these holes, two in each. As the proportion of male to female trees is usually 1 to 3 (on rare occasions it may be as high as 1 : 1), a sufficient number of seedlings must be kept ready to take the place of those which turn out to be males. The trees usually flower after five months and all males (except one or two), must be pulled out. If both the trees in any one hole turn out to be female, as they often do, pull out one, so that there is ultimately only one tree in each hole.

In the Bombay Presidency, seeds are generally sown twice a year—in February-March and then again in September-October. Careful and sufficient irrigation is necessary, if large yields and heavy fruits are desired. The trees may appear outwardly healthy even though the water supply is really insufficient. When the plants are young, daily watering may be necessary, but later on, if canal or well irrigation is available, it would be sufficient to water them once a week.

Water should never be allowed to stagnate round the roots, as the Papaya is the first fruit tree to suffer from water-logging and rots at the soil-surface. Usually the tree grows a straight stem but sometimes it branches out. It is usually best to remove any side shoots if they appear. Also, remove all dead leaves as soon as they begin to turn yellow. Individual trees vary greatly in their productivity. Some will produce quite a large number of fruits, necessitating thinning out of some of the fruits so as to give them sufficient space to develop, while

others may produce only a few fruits. Fruits are generally formed at the axils (the angle formed by a leaf with the stem on the upper side), usually singly but sometimes in twos or threes.

The life of the Papaya tree, under favourable conditions, is about ten years or more. The first two or three years, however, are the most productive and when grown on a commercial scale, the orchard is generally renewed every two or three years. The trees come into bearing within a year's time and keep on producing fruits month after month. The average annual yield for trees in good condition should be in the neighbourhood of thirty fruits weighing two to four pounds each.

It is well recognised that the Papaya contains peculiar and valuable digestive properties which make it of great value in the diet. A small piece of unripe fruit added to meat while cooking makes it very tender. These properties are largely due to the presence of papain, a very active ferment somewhat similar to pepsin. The papain is secured by scarifying or bleeding the ripening fruits when they are on the trees. The juice is then dried and exported to America and Europe in its crude state. There it undergoes further changes and is sold under various trade names at a high price. Ceylon is the greatest papain producing country on our side.

There are no fixed varieties of the Papaya. The two most common types generally grown being known as long and round—more or less cocoanut shaped. Of these, the first is supposed to be superior in quality. In Ceylon, the round variety is generally grown, as it grows to perfection there, and is mostly grown on perfectly sexed plants. One variety, with leaf stalks slightly marked purple and known as the Washington, has round fruits of good quality which grow singly in the axils requiring no thinning. Since it is difficult to keep the varieties or types distinct, they seldom come up true from seeds.

The quantity of seeds contained in each fruit seems to depend upon the fertilization or non-fertilization of the flowers at the time of setting fruits. If on account of rains or other climatic conditions, the flowers are not effectively fertilized, the fruits are not likely to contain much seed. Thus, it may be seen that there is no truly *seedless* Papaya. For, if a muslin bag is put around a flower as soon as it is set, no pollination will take place and the resulting fruit would be seedless.

The possibilities of development of the Papain industry in India as also of fruit growing are great, and we understand that the U. P. Government Technological Institute at Cawnpore is experimenting with the object of producing papain on a commercial scale in a finished condition.

HEDGES.

Many dwarf growing shrubs and trees are used for making hedges. Those with small, ever-green leaves and compact growth and which are amenable to pruning make the best hedges.

Hedges are grown sometimes in place of a fence or wall, for which purpose, however, they are not very satisfactory, unless well-grown in a deep and rich soil and kept clear of weeds and plentifully watered in dry season, a hedge does not present a very pleasing appearance. Ornamental hedges to mark off one portion of the garden from another need more attention and constant pruning to keep them to a desired height and to present a neat and trim appearance.

The ground must be well prepared before sowing the seeds. Make a trench two feet deep and as much wide. If the soil is deep and fertile, only one single row of plants would make a good growth in a short time—say from six months to a year—but if the soil is not so good, it is desirable to put in some good soil and lots of manure and to sow the seeds in a double row, the rows being about two feet apart and the seeds at a distance of about 4 to 6 inches from one another. Cover the seeds about an inch deep and water carefully. At first, in dry weather, water daily or every other day. Later on, when the plants have made some growth—say over a foot—it is desirable that more thorough and copious waterings should be given but at longer intervals.

The best time to start a hedge is usually during the rainy season, but it is also possible to start it after the rains are over, if watering is done frequently and at regular or needed intervals. It is best to sow the seeds directly in the rows where they are needed and not to try to transplant them from other quarters.

It is frequently asked if a hedge would grow without water. If it is started in the rains and if the soil is deep and rich, then the plants will not die in dry season, if not watered. But naturally they would not make the same satisfactory growth and present a green, fresh appearance as when they are regularly watered. But if the ground is very shallow or rocky and the soil poor, a satisfactory hedge cannot be made without watering.

We generally recommend two kinds of seeds for hedges—*Inga dulcis* and *Dodonaea viscosa*. The former is a rather coarse, much-branched thorny shrub very largely used for making an impenetrable hedge. When closely and well-grown, it effectively prevents animals from entering. The latter is an ornamental hedge with small, beautiful, shining, ever-green leaves very largely used in both Northern and Southern India. If planted in a double row, it makes a perfect hedge within a year's time. It produces pretty light yellow flowers if not pruned. Though the wood is a little hard, it is amenable to pruning and can be kept to any desired height.

A pound of *Inga* seeds will sow a row of about 500 feet long and a pound of *Dodonaea* about twice this length.

PART IV
FLOWERS

ROSES

Roses do well in almost all soils, except those of a sandy nature; what they really like is a deep, well-drained, heavy clay-loam. They will not thrive where there is stagnant moisture. If these conditions are not to be had naturally, they must, as far as possible, be provided. If drainage is bad, the soil must be thrown out to a depth of about $2\frac{1}{2}$ of 3 feet, and the bottom covered with broken stones or bricks, large cinders or other rough material to a depth of at least 8 inches. If the soil happens to be pure clay, it should be lightened by an admixture of air-slaked lime, say two tons to the acre or one pound to the square yard; a good dressing of ashes, old mortar or sand may also be applied with advantage. Well-rotted horse-manure containing grass, should suit this class of soil best. But if the soil is inclined to be light, a good addition of clay or heavy loam, together with cow manure will improve it. Soil from river-beds where obtainable, will also serve the purpose well. As the outlay in making a suitable rose-bed is only incurred once, it is worth while going to some trouble and expense to get the plants into a suitable soil.

When preparing a bed for roses, it is well that the soil should be removed from the bed to a depth of at least 18 inches, and after having passed it through a rough sieve, a liberal quantity of manure should be incorporated with it. The bed then must be refilled with this prepared soil. The bottom 8 inches of soil is better thrown away or used for some other purpose. After the bed is filled, it should be freely watered so as to settle the soil. If this is done 4 or 5 days before the plants are planted, the soil will be in an excellent condition to receive them.

Where it is possible to do so, it is advisable to give the Roses a piece of ground to themselves. The site should be away from the shade of trees or from competitive tree roots. The rose is a fairly deep-rooted plant requiring a lot of nourishment; therefore the beds in which they are grown, should be prepared on a liberal scale. An addition of bone meal (steamed, crushed bones) at the rate of about a pound to a square yard will enrich the soil considerably.

The distance at which the plants should be planted varies greatly with the variety, the nature of the soil, and the size of the garden. Small "Own root" plants may be planted as close as 2 to 3 feet. Larger plants at a greater distance, say 6 feet each way. In small gardens, where only a few roses are grown, they may be grown in large pots or tubs. "Standards" adapt themselves very well to pot culture.

Roses are propagated by seeds, cuttings, layers, budding and grafting. The first method is difficult and tedious, as seeds germinate very slowly and plants thus raised take quite a long time to bloom. Only florists who want to raise new varieties use this method. The commonest methods are by budding and layering. Cuttings strike easily during the rainy months but only a few varieties can be successfully grown, as others do not strike readily. Plants grown either from cuttings or layerings are called "own root" and are usually more satisfactory for ground cultivation than others, because they produce more branches and are hardier. It is generally conceded that budded plants produce finer and larger flowers than others.

Pruning the rose is an important operation and much of the success or failure in blooming satisfactorily depends on this. Its purpose is to conserve the energies of the plant by directing its vitality into those

branches which can best use it, and still further to concentrate it into the proper number of flowers which the plant can develop to perfection. It also helps the plant to spread out into shapely growth, well-balanced, and admit plenty of light and air among the branches. All dead wood and undesirable or weak growth should be removed. Different varieties with varying habits of growth, require different ways of pruning, but as a general rule, it may well be noted that weak growing plants need harder pruning and vigorous growing ones, less.

Pruning should be done at least once a year, preferably during October in the U. P's and the Punjab, and in the Southern part of the Peninsula. In the Poona District, roses are generally pruned a little before the rains start in June. Before pruning, it is well to *rest* the plants by gradually withholding water for about a month. Then an inch or two of the top soil may be removed and replaced by 2—3 inches of any well-decayed, rich manure and the plants watered profusely. Or the ground may be lightly ploughed or harrowed and fresh manure given as a top-dressing. If grown in pots or tubs, after the plants have rested (by gradually withholding water), they must be entirely removed from the pots and repotted in fresh soil and manure. While repotting such plants, part of the old roots may be removed by carefully cutting them. In pruning, it is safer to err on the side of hard pruning than moderate pruning. During growing season, thinning out weak branches here and there occasionally, helps to promote free flowering. On Hill stations of Northern India, pruning is generally done at the end of winter or early spring.

CARE OF PLANTS ON ARRIVAL.

Prepare the bed as suggested in the second paragraph, a few days in advance of receiving the plants, if possible. Unpack the plants in a cool, shady place. If the plants appear in any way dry, they should be submerged in water, roots and tops, for a few hours before planting. This drying-up frequently occurs because of the shock the roots receive during the journey; they should not be kept in water longer than necessary. The best time to plant is in the evening. Roots should be guarded against drying out while planting, by a piece of wet burlap and should not be exposed to dry winds or the sun even for a short time. Perhaps the best way is to keep the plants in a pail of water mixed with soil to the consistency of thick cream until they are actually put into the hole for planting. The holes need not be made bigger than is necessary to spread out the roots in a downward and natural position. Generally, about 15 inches deep by about 12 inches wide, in previously prepared ground is about right. Do not plant too deep or too shallow. Then water thoroughly to soak the bed deep down to the roots. Spraying the plants with plain water twice a day, morning and evening, greatly helps them to establish new growth. Generally, some leaves from the plants are removed before packing to prevent them drying out too soon. It is advisable to prune back the Rose plants to within 4 to 6 inches of the branches, a week after they are planted. After growth has commenced a top dressing of nitrate of soda (an ounce per square yard) at intervals of a few weeks will stimulate the plants into action.

It must be noted that a "budded" rose is one in which the root is different from the top, the latter having been growth from a "bud or eye" of the desired variety inserted on a plant of another variety called the "understock or stock" which is expected to give it greater vigour. Most of the budded roses offered by our nurserymen are budded on the common "Edward" Rose. Any suckers or shoots which may spring up

from below the point of contact, should, therefore, be removed as soon as they appear, otherwise they would sap the vitality of the "desired" plant and ultimately may kill it.

INSECTS AND DISEASES.

Roses are subject to several enemies in the form of insects and diseases. As long as the plants are vigorous and strong-growing, they are able to withstand most of them. In the following few paragraphs, we have described some of the common pests and diseases and have suggested their remedies. Since spraying and dusting are the chief controlling operations, a small hand sprayer and a dusting gun should form part of the equipment of every garden. There are both large and small machines for all purposes. In spraying and dusting, it is most important that the foliage be covered on both the under and the upper sides.

Black spot which disfigures and destroys the foliage, *Mildew* which attacks both the bud and the foliage by covering them with a felty whitish coating, and *Cankers* of various sorts which attack the stems of the plants are some of the chief diseases. The great preventive material for all these is sulphur-dust. Then there are insects which either eat the foliage and the flowers or suck the sap from the stems. The cure for the former is a poison, usually arsenate of lead, and for the latter, nicotine. Sulphur for the diseases and arsenate of lead for insects can be put on with one application. The nicotine preparation is used separately. As it is generally difficult to check a disease after it has spread considerably, the best method to keep the plants always healthy is to use the sulphur and the arsenate of lead continuously at short intervals, say once every ten or fifteen days, especially during periods of trouble. The nicotine need be used only when necessary. This protecting material (Sulphur and arsenate of lead) should be always present; as rain will wash out these materials, it is advisable to use them more frequently during the rains. If in spite of frequent dustings with sulphur, mildew appears, a solution of bicarbonate of soda will remove it. The strength of the solution will depend upon local conditions and so should be determined by experiment.

Bordeaux Mixture (a combination of copper sulphate and lime) which is a standard fungicide is very effective against *black-spot* and powdery or downy *mildew*. It can be had from any nursery or seeds man. Bordeaux mixture is also used against *canker*. It should be applied in autumn after cutting out all cankered canes, giving both the remaining stems and the ground a heavy coating.

There is only one cure for the insects which eat the flowers and leaves; that is to poison them. It is, therefore, necessary that the poison be on the leaves before the insects start to chew. As sulphur can be combined with arsenate of lead, by giving the sulphur treatment (to combat the fungus diseases such as mildew, black-spot, etc., mentioned earlier) the insects can be circumvented also. Nine parts of dusting or powdered sulphur (not the ordinary "flowers" of sulphur) and one part of arsenate of lead may be used very effectively. Thus arsenate of lead may be added to Bordeaux mixture and used for above.

Black spot usually appears after a rainy spell or a heavy watering, and first attacks the older leaves. When it appears, all affected leaves either on the plant or on the ground, should be carefully picked and burned to prevent a further spread. This should be followed up by remedies suggested above.

There are a number of chewing insects for which no real remedy exists. No one has yet invented an efficacious method for destroying the rose-beetle, rose-bug or rose-chaffer. Methods such as protecting special plants by covering them with nets, picking the bugs by hand into a jar of kerosine etc., have been tried but with partial success only. Some of these insects can be trapped at night by hanging a lantern over a pan of water to which a little kerosene is added. The insects are attracted by the light and fall into the water or the plants shaken to cause them to fall into the water.

Among the sucking insects the most troublesome is the *aphids* or plant lice. They cluster in great numbers on the tips of growing shoots and on the under-side of leaves, and suck the juice from the young leaves and buds. They can be easily destroyed by a solution of nicotine sulphate. Two or three consecutive applications twenty-four hours apart will usually dispose of them for a long time. Tobacco dust can also be used for the same purpose, but is cumbersome and unpleasant to use.

The *Red Spider* is another pest which sucks the juice from the under-side of the leaves. Frequent sprayings beneath the foliage with nicotine sulphate will end the trouble. Copious dashes of water by a strong syringe or sprayer are also equally effective.

Wasps are also very troublesome and eat away rose-leaves quickly. It is easy to destroy them if the localities of wasps' nests are known. Dissolve an ounce of cyanide of potassium (which is a deadly poison) in a quarter of a pint of water. Soak a piece of cloth or cotton-wool in this and lay it over the entrance to the nest. After two hours remove it as it would have done its work by that time and every insects and pupæ will be found dead.

Another method to destroy *wasps* and *hornets* when their colonies are not traceable, is to trap them. Place a fully-ripe fruit beneath the tree and over it a hand-light raised about three inches above the ground by stones placed at four corners. This light must have a rather large hole at the top. Upon it, rest another light from which all means of egress is shut off, except through the apex of the lower light. The wasps, after eating the fruit, will rise into the first light and gradually find their way through the opening into the one above, from which, it is not possible for them to escape. *Slugs* of various kinds can be overcome by the use of a solution of 1 ounce of arsenate of lead in 1½ gallons of water. The *Rose-leaf Roller* may also be treated with the same spray or by hand-picking.

The *Rose beetle* which feeds at night on the tender leaves, boring holes in them, can be controlled by Paris Green (1 ounce to 4 gallons of water) to be sprayed in fair weather.

The *Smooth Caterpillar* is a slender green insect feeding voraciously on the edges of the leaves. It is controlled by using Lead Arsenate—1 ounce to 4 gallons of water.



ANTIRRHINUM.

(*Snapdragon.*)

Press the side of the flower and the dragon's mouth will open, closing when released. This is a perennial but is usually grown as an annual. To keep the plants for a second season, cut them down within a few inches of the ground when they have apparently finished flowering, stir the soil lightly and give a top-dressing of manure and they will produce new shoots and flowers.

Snapdragons have been greatly improved of late and many new colours have been introduced. They can be had in three heights—the tallest class growing about 3 feet high, the intermediate about 1½ feet, and the dwarf about 9-10 inches.

Sow on the plains during September-October. On the hills from March to June. Also in early Autumn. On the plains, where the rainfall is light and the weather cool, they can be sown also about the end of May or beginning of June, when they will flower from September onwards. They will keep on blooming month after month, if the faded flowers are constantly removed and no seed-pods allowed to mature on the plants. It is a good plan to pinch out the tops of plants when they are small—say when they are about six inches high—so that they do not flower very early and thus root-growth encouraged. If flowering is thus deferred a little, the plants will throw out more side-shoots and flower better.

They may be grown either in beds or pots. Transplant the seedlings as soon as they are large enough to be easily handled, at a distance of 9 to 12 inches. In rich soils, the distance may be greater. The intermediate class is best for bedding out and also fairly good for cutting. The tall class furnishes better material for cut-flowers, as the spikes are longer. Being hardy and very easily grown, they grow and flower even in poor soils, but they do much better in rich soils and quickly respond to generous treatment. Frequent doses of liquid-manure or some quick-acting fertilizer, greatly help to bring them to perfection.

ASTERS.

Callistephus Chinensis [Nat. Ord. *Compositæ*] is the botanical name of the original single-flowered Aster which came from China nearly two hundred years ago. Because the original plant came from China, the whole family of garden varieties comes under the general title of China Asters, and also as the German florists have developed the flower and produced a considerable number of races, it has also come to be known as German Asters.

Comparatively few people, however, are fully aware of the great extent to which this beautiful flower has been developed during recent years. The Chrysanthemum-like flowers are unsurpassed in beauty. They vary in colour from a delicate pink and white to deep reds and purples. They are especially adapted to house decoration, and when cut and placed in water, hold their regal heads erect for one to two weeks without withering. If a teaspoonful of cane sugar is added to the water in which the cut flowers are placed, it will do much to freshen them. No other plant occupying the same space provides more cut flowers as Asters. By planting Asters of the early-flowering type followed by a late variety, flowers can be had for quite a long time. The plants vary in height from 8 inches to 3 feet in different varieties, and in the matter of form, there is a wide and pleasing variation.

Some of the types have incurving florets; some have broad and loose, elegant florets; some are imbricated; some quilled.

Asters can be easily grown in every part of India. They naturally succeed best in a rich, loamy soil and in cool weather. But with proper attention to the season of planting and careful cultivation, they can be grown quite successfully in any fair garden soil.

Among the secrets of success in raising Asters to perfection, we may mention that the plants should receive no check in their growth, from the seedling stage to bud development; also they should not be subject to violent changes in temperature and a very high temperature is at no time desirable.

Asters, though surface-rooting plants, are gross feeders, therefore, for best results, an abundance of food and moisture must be continuously furnished, a well-enriched loamy soil deeply worked, being essential to induce roots to go down for their supplies of food and moisture. When the roots are confined to the surface, the plants are liable to dry out or starve. A good covering mulch of rotten manure or hay in hot, dry weather is very beneficial, as it does not allow the soil to dry soon and provides some nutriment. Watering should be done whenever necessary. It should not be given in very small quantities but in doses large enough to thoroughly saturate the soil. Otherwise, if the soil is only superficially wetted, the roots are likely to be drawn towards the surface, which being usually hot in day time, greatly injures the plants.

The seeds should be sown thinly in shallow drills about three inches apart, just covered with fine soil (not over a quarter of an inch deep), either in a finely prepared seed-bed or in shallow boxes (2½ to 3 inches deep) or in earthen pots. They may also be sown broadcast, lightly covered with fine soil and pressed down firmly, so that the seeds may come in close contact with the soil. Water very carefully and gently, never letting the seedlings suffer for want of water. The best compost in which to sow the seeds and grow the seedlings, is made up of about equal parts of decayed leaf-mould and loamy soil, with a little addition of wood-ashes and some fine sand to facilitate drainage. In absence of leaf-mould, use well-rotted horse or cow manure. When the seedlings have attained the third leaf, they should be carefully transplanted about two inches apart, into other seed pans or shallow boxes containing fresh soil of a similar nature. This early transplanting checks the tendency to damp-off, and gives the individual plants sufficient room to develop a stocky growth. In two or three weeks' time, if the seedlings have been grown properly, they may be potted off singly in small pots or bedded out. When the plants are transplanted to the flower-beds or pots, firm or pack the soil solidly about the roots of the freshly set plants, allowing the soil to remain in this condition for about a week, and watering when necessary. After this, the soil should be frequently stirred as will be suggested below. In the early stages of their growth, they may be given partial shade, though it must not be forgotten that they need plenty of light and air at all times.

Keep the ground free from weeds and frequently stirred, but do not go deep enough to injure the surface roots. Thorough and frequent cultivation is very important and at no time should the surface be allowed to get hard or baked. This condition results in the soil quickly becoming dry, prevents the admission of air to the soil, thus

checking the growth and weakening the vitality of the plants. When well in bud, a top-dressing of rotted stable manure should be given, which not only will nourish the plants but will keep the surface of the soil cool and moist. It is only when grown under such conditions that really fine flowers come up and the plants hold out. Fresh manure should never be used for Aster culture, as it may scorch the plants. Occasional applications of liquid manure (which must not be too strong) generally assists in producing magnificent flowers.

To grow prize flowers, use the large flowering (mid-season and late) varieties, allowing the well-grown plants to carry but five or six main stems, each with its terminal flower; all other stems, side branches and buds should be removed to throw the full vigour of the plants into the few remaining flowers.

Asters, especially those of the dwarf, compact types, are very decorative as pot plants; for this purpose, it is only necessary to lift the plants when they are just forming flower buds, disturbing the ball of earth as little as possible, and pot them. Water liberally, and shade for a few days from the sun, until root action has returned and the plants seem to be growing and well established. Then they may be brought out in the open.

For bedding, the usual distance is about 6 to 8 inches for the very dwarf sorts; 10 to 12 inches for those of medium height and 15 to 18 inches for the tall, late-growing varieties.

The Aster fares best during the cool rainy months, from June to October, in places where the rainfall is not heavy—not over 40-50 inches or so. But where the rainfall is heavy, the best time to sow is soon after the rains,—in September-October. In Madras and Southern India, the sowing time is also September-October. On the hills, sow from March to May and also in Autumn.

To the amateur, who is not familiar with the above method of cultivation, it will sound very laborious, but in practice it will be found that if the stirring of the soil, transplanting and other operations are repeated frequently, an ordinary sized bed or two, or a few dozen pots in an average garden, could be managed quite easily, and the reward will be certainly adequate to the trouble taken.

BALSAM.

(*Impatiens balsamina.*)

The garden Balsam or Lady Slipper is an old favourite. They are rather formal plants of neat, compact habit. The flowers are produced close to the stem almost hidden among the leaves, and some gardeners remove a few leaves, the better to disclose the blooms. The plants may be grouped in the border or used as low hedges alongside the edge of large beds.

It is one of our very best and perhaps the most popular of our monsoon annuals. The plants make very quick growth and flower quickly and abundantly. As the flowers have very small stems, they are not suited for cutting. The blooms are of many beautiful colours and delicate shades—white, blush, pink, salmon, rose, crimson, purple, violet, etc.

It is very easily grown and should be found in every garden during the rains. Seeds may be sown at any time from the beginning of the rains onwards—say from June to August. On hill-stations, from

April to June. In Madras and Southern India, the best time is from August to December. In upper India, it is also grown during the summer months.

Balsams quickly respond to extra care such as enriching the soil and a little liquid fertilizer. With good care, strong side-branches will be thrown up by the plants and there will be perfect wreaths of flowers. They must be given an open, sunny situation and should never be allowed to flag for want of water. Transplant when the second leaves have made a little growth. Set the plants about a foot apart. When the side branches appear, pinch off all but three or four and also pinch out the centre shoot. Those left will grow strong and the flowers will not be much concealed by the foliage, as will be the case if the plants are left unpruned. Some gardeners keep all the side-shoots pinched off, leaving only the main, upright shoot. This gives a good effect if the plants are well grown. When only the main stems are allowed to flower, the plants may stand closer together—say about 8 inches. Others leave the plants entirely untouched.

Transplanting the plants twice or thrice will produce dwarf plants and more double flowers. Balsams can also be grown in pots, if given proper attention.

Sometimes the choicest seeds will produce plants with mostly single flowers. This is usually due to two causes: "Forcing" weather and poor soil. When weather is continuously hot and moist, the plants do not make sufficient root-growth, and burst into bloom earlier than usual. Much cannot be done in such cases, but the removal of flowers as soon as they appear and an application of some fertilizer, generally improves the growth and the flowers that follow will be perfectly double.

BEGONIAS.

Fibrous and Tuberous-rooted.

Begonias succeed best in a cool, partially shady situation, and need a light, loose, though fairly rich soil. The two classes named above are distinguished, the first by its numerous fibrous roots and small yet numerous flowers and its almost perpetual blooming quality; the second by its large tuber, which lies dormant like that of the Dahlia or the Gladiolus after it has finished its growing period, and by its very large and bright-coloured flowers.

When grown from seeds, very cold weather should not be chosen, as they need warmth and will not come up and grow satisfactorily if the weather is very cold or frosty. The seeds are very very minute and require great care and gentleness in growing. Any light, fairly rich garden soil, mixed with an equal quantity of well-rotted leaf mould, to which is added a small quantity of fine sand and charcoal dust, will make a good compost to start the seeds in. This should be sifted through a rather fine-meshed sieve and the surface made perfectly level before sowing. Sow the seeds in shallow pots or boxes. These may be watered carefully a few hours before sowing. The seeds may then be mixed thoroughly with a small quantity—say half a cupful—of the compost and sprinkled evenly on the surface of the soil, and gently yet firmly pressed down. When the surface soil begins to dry, the pot may be immersed in another pot or pan of water so that the soil may soak water from the bottom. Thus overhead watering which is injurious to the fine seeds is avoided. Shelter the seed-pot from direct

sun or heavy rain, and if the weather be sunny and bright, the pot may be covered with a piece of glass overlaid with a sheet of paper until the seed germinates. This will tend to conserve the moisture and prevent intense light from reaching the soil. The glass and paper should of course be removed as soon as the seedlings appear. See that the soil is kept constantly moist (but not too wet), and is never allowed to become dry. After a few days, a green, moss-like growth will be observed as the seed starts into growth. Care must be taken not to over-water the plants or they will rot,—“ a little and often ” being the best rule in watering such tender and tiny seedlings.

The young seedlings are likely to come up too thickly—especially of the fibrous-rooted sort, as they have more vitality than the other—and will need transplanting as soon as they have formed two or three good-sized leaves. The seedlings may be transplanted in other pots or “ flats ” (see under “ Pots, boxes and tins ” in Part I), lifting them very carefully with a knife or a small, thin paddle of wood and putting them down at a distance of about 2 inches apart each way. When transplanting plants with fine, fibrous roots, it is well to lift a large ball of the soil with the plants, so that the roots may not be disturbed more than is absolutely necessary. Make holes to set them in, sufficiently large to receive them. Use similar soil as the first, and here let the plants grow, until they begin to crowd each other out. It may be found when transplanting, that some tiny plants stick together and are difficult to handle singly. In such cases, treat the clump as one plant and carefully put it in a hole prepared for it in the new soil. Here they may grow for some time, and when large enough, may be again divided and treated like single plants. Give them a partially shady, though rather warm place. Once the plants reach a certain size, their growth is rapid, and they do not need such careful handling as before. At first, the plants may be put singly in small pots, from which they should be transferred to larger pots as they increase in size. The treatment of both the types of Begonias is similar in the earlier stages of their growth ; but the fibrous-rooted type will grow more quickly than the tuberous-rooted.

The Begonia is a shallow-rooted plant, the roots remaining near the surface. When stirring the soil, care should therefore be taken, not to work too close to the plants, nor too deep; otherwise the smaller tender roots are likely to be injured. A light mulch of straw or manure is very beneficial.

The Fibrous-rooted Begonias begin to bloom when quite young, and are perpetual bloomers—that is they will bloom throughout the year if given plenty of moisture and enough room, together with a rich soil, for the roots. They may be used as pot plants in the summer months in a conservatory, or if desired, they may be planted out in flower-beds in mild winter weather, or during the rainy season where rainfall is not very heavy and the weather more or less equable and not very hot. They will bloom more freely and produce larger flowers if the blooms are cut off as soon as they fade and are kept from producing seed, which rapidly exhausts the strength of the plants. After the plants have flowered for some months and when they begin to show signs of age, they may be transferred to larger pots, using a rich compost. The tops of the plants should be cut down nearly to the base. The roots will then throw out fresh, strong shoots

and will again make fine blooming plants in a short time. They are also propagated easily by means of cuttings during the rainy season.

The Tuberous-rooted Begonias are distinct in growth and flower, the plant being more open in growth, and the leaves and flowers larger. Besides, they are more brilliantly coloured than the preceding type, and possess a greater diversity of colouring. In general, they are most satisfactory as specimen pot-plants in a partially shaded porch or a cool plant-house, or as hanging-basket plants. Otherwise, if planted in beds, they must be given a partially shaded location for the best results.

Unlike the fibrous-rooted sorts, they do not bloom early. These plants, however, must attain a certain size before they flower. The large flowers are sometimes too heavy for the stems and need light stakes to support them. Drainage should be perfect, and no water allowed to stagnate near the roots. When planted in beds, they may be put down about 15 inches apart each way. After they have finished flowering, the plants generally begin to dry up, and in order to preserve the bulbs for the next season, water should be discontinued gradually, and when the leaves and stems have nearly all died down, the plants may be dug up and after removing the dead stems, the roots carefully stored in a cool, dry place, either in sand or dry soil. Long exposure to rain, when the plants are growing, is very injurious, and sometimes kills the plants.

The Tuberous-rooted Begonias are grown much more easily and in less time, by putting down bulbs purchased from seedsmen or nurserymen. They are not very costly, and are stocked in different colours.

On the plains of Central and Southern India, sow the seeds about the beginning of the rains. In the North, during September-October. On the hills, from March to May.

CANNA.

Canna Indica or **Indian Shot** is native to India, and grows abundantly and luxuriously almost everywhere. The original plant grows about 5 to 6 feet high in its native wilds and produces small and insignificant flowers of scarlet and yellow. It is not usually given a place in flower-gardens, except by those who prize it for its foliage and the tropical effect it gives to the garden.

In the hands of the hybridisers, this plant has undergone a marvelous evolution, emerging from the centuries of its obscure life into a revelation of beauty and grandeur equalled by very few plants. As a bedding plant it holds front rank and is often described as their "king" in the catalogues of European and American nurserymen. In Europe—especially in France and Italy—and in America it has become a general favourite and is very extensively employed as a summer bedding plant. Those who have not seen the latest varieties in bloom can hardly conceive of their beauty, so much have they been improved during recent years.

Some horticulturists divide the modern varieties into two classes according to the habit of the flowers—the **CLASSIFICATION** Orchid-flowering and the Truss-flowering. The first is very large flowering and usually taller than the other varieties.

But in this class, the flowers do not all open together, which is sometimes a disadvantage. In the second class, the flowers mostly open together and form larger heads. They are therefore often preferred. Most of the newer creations belong to this class and large beds of one solid colour make a very impressive display. Other horticulturists classify Cannas according to the colour of the foliage—green or bronze.

The cultivation of the Canna is very simple. As it is a gross feeder, no soil can be made too rich for it. Select an open situation, dig the soil at least two feet deep and enrich it well with any well-rotted manure. Plant the roots rather deep, covering them well, and water rather sparingly for the first few weeks. It is always a good plan to cover the roots with some fine sand on all sides, as otherwise some of them are likely to rot and die. Later on, water freely and copiously. They make a good show if planted in round beds or long borders. They can also be very effectively grown in large pots, preferably in wooden tubs. They grow rapidly and flower quickly, and for many weeks. The flower-spikes, after they fade, should be cut down at the bottom near the ground, when new shoots will quickly come up to take their place. Frequent doses of liquid manure while the plants are growing, will be found beneficial.

They can be transplanted at almost any time of the year, but the best time is about two or three weeks before the rains commence, and then again after the rains are over. They could thus be made to flower first during the rains, and again during the cold weather. By judiciously timing the transplanting operations, flowers can be had throughout the year, and they have been known to flower even during the summer.

They multiply very quickly; it is therefore advisable never to allow them to crowd themselves out, as then the flowers begin to deteriorate. It is best to change the site every other year and to lift and transplant the root-stock every six months or so, discarding the old roots and transplanting newly formed roots with buds. Before transplanting, it is an excellent plan to withhold water for about ten or twelve days, then to dig up the plants carefully and heel them together in an upright position in a cool, shady place. The beds may then be dug up about two feet deep, replenished with fresh loamy soil (if the original soil is not very rich) and well-rotted manure, and after this, the rested roots may be planted in the usual manner.

When one variety is planted in a round bed by itself, the effect is excellent. The usual distance at which to plant Cannas is 18 inches apart each way. Plant 1 Canna in the centre, 6 in the first circle, 12 in the second circle, then 18, 24, etc., according to the size of the bed, with the circles 18 inches apart. A bed 4 feet in diameter takes 7 Cannas; a 7-foot bed, 19 Cannas; a 10-foot bed, 37 Cannas; a 16-foot bed, 91 Cannas.

Some of the recent varieties are very shy seeders while others seed freely. The former usually maintain their height and do not deteriorate even when grown year after year. The latter are likely to grow taller, and to deteriorate quickly—especially if neglected for some time.

On the Hill stations of Northern India, the best time for planting bulbs is perhaps March-April. Being tropical plants they cannot stand frost and so on its approach they should be lifted like the Dahlia and stored in a rather warm dry place covered up with dry sand or soil. Replanting should be done on the approach of warm weather the next spring.

Their propagation is usually effected by division of the roots (or rhizomes, as they are more properly called). This is the commonest method. New varieties can be raised from selected seeds, which are round, black and very hard, of the size of small peas. The name Indian Shot is due to the resemblance of these seeds to lead shot. Seeds ordinarily take a month or more to germinate and owing to their hard shells come up very irregularly. If the outer covering is filed by an ordinary file in one place or opened up by a sharp penknife, so that moisture can reach the germ, they germinate very quickly and easily. Keeping them in hot water for about 24 to 48 hours or in cow-dung paste for 2 to 3 days before sowing, is also a good method to hasten germination. All plants raised from seeds will not produce large and good flowers, as they have a tendency to "revert" or go back to the original type. Those which are not good may be discarded, and the good ones taken care of.

There are about 500 or more named varieties on the market, but many of them are only duplicates. Several new varieties make their appearance every year and sustain the interest in this plant from year to year. The recently introduced varieties are indeed very fine from every point of view, and Canna lovers would do well to grow at least a few of them, side by side with established varieties.

CARNATION.

In Europe and in many parts of America, where great attention is paid to its cultivation and development, and where it grows to perfection, this beautiful and favourite plant is supposed by many to be a rival of the Rose, hundreds of lovely named varieties are grown, magazines are devoted to its culture, and societies are formed by flower-lovers to further its progress.

The Carnation is generally divided into two classes: The Perpetual or Early-flowering, and the Hardy or Border Carnations. The former is treated more or less like an annual, coming into bloom within four months of sowing the seed, and flowering continually for months. The latter usually flowers the second year from seeds, and is hardy in cold countries, requiring only a little protection in winter and blooms for some years. It is the former class which, however, is more adapted to the warmer parts of our country, and can be grown anywhere in India, with a very fair degree of success. On hill stations and in North India, very little difficulty is experienced in growing both the types.

On the plains of India, the best time to sow the seeds is about the end of the rainy season. In places with a moderate rainfall, they could be grown even during the rains, especially if protected from occasional heavy showers and from long spells of wet weather. The early strains will flower all through the cold weather, and even during part of the hot weather in places where the summer heat is not great, especially if the plants are removed into the shade of trees. On the hills, the early strains may be put down as soon as the weather has become mild in March or April, and the other old-fashioned Border Carnations may be put down from June to August, the earlier the better.

The Carnation thrives best in a compost made up of turfy-loam, enriched with leaf-mould and well-rotted cow or horse manure, with a little addition of sand and charcoal dust. Sow the seeds in well-

prepared seed-beds or pots, rather thinly, covering them with about a quarter of an inch of fine soil, and when the plants have come up and are about two inches high, transplant them singly in small pots; shift them to larger pots as they grow bigger. To ensure good flowers, the blooming stems should be carefully tied to sticks inserted near the plants and the buds thinned down to only one or two flowers on each stem, the general rule being to allow only the top and third bud to remain and to remove the second (which is usually too near the top bud), and other buds. Frequent doses of weak liquid manure are very helpful. The plants may also be bedded out in favourable weather and will make a very good display in the garden for months. The early flowering class of Carnations has also the advantage of a strong clove scent and its introduction has given a great impetus to the cultivation of this hitherto difficult plant. We have been able to make these plants bloom throughout the year, even during the summer months, in the climate of Poona.

It has been found that the use of a 0.1 solution of boric acid (one in ten parts) will improve the keeping quality of cut Carnation flowers by three to seven days.

When grown from seeds, a certain small percentage of plants produces single flowers; these plants may be destroyed. Some choice varieties may be propagated by cuttings or layerings, during the rainy season.

CHRYSANTHEMUMS.

THE JAPANESE CHRYSANTHEMUMS are very popular, and make a grand show in the garden if well grown.

They are easily raised from seeds, though they take a long time to come up and bloom, and produce only a small percentage of truly good varieties with large flowers. But this is the cheapest way of growing a large number of plants, some of which may turn out to be quite good. The usual method of propagation is, however, from the side-shoots or suckers and cuttings.

Sow the seeds during June-July, in places where the summer is not very hot and long, and during September and October in the U.P. and Punjab. Plant the seedlings singly in small pots as soon as large enough to be easily handled, and shift on to larger pots as they grow. Give frequent doses of liquid manure to the growing plants, and otherwise treat as plants grown from suckers or side-shoots, as detailed below.

After the plants have finished flowering, cut down the old stems, and in January, dig them up or take them out of their pots. Remove the earth from the roots, tear apart all the shoots or suckers, and plant them singly in the richest soil available, using plenty of manure, and watering very freely when growth has commenced. Another plan more generally practised is to take small cuttings from these plants during the months of January to March, and to insert them in some very light but not too rich soil. They generally strike roots readily. Plants raised from cuttings are generally preferred, as they have a better root system and throw up less suckers. The Chrysanthemum is a gross feeder and needs a lot of nourishment. After the rooted cuttings or suckers have filled their first small pots with roots and have out-grown them, they should be shifted to larger pots, giving fresh and rich soil and strong manure. Frequent doses of liquid manure, artificial fertiliser, or

guano may also be given from time to time to stimulate growth. These plants usually produce too many buds, more than the plant can well care for. To have large blooms the usual practice is to disbud the plant very rigorously, leaving but one flower—usually the top-most—to each shoot, and not to allow more than three or four such shoots to each plant. Each shoot should be carefully supported by a light stake firmly planted in the soil, as, usually, the large flowers are too heavy for the plants to stand erect. A continuous and uninterrupted growth is necessary for good results. The plants should never be allowed to suffer for want of either water or nourishment at any stage of their growth.

In order to keep cut flowers fresh in water for some days, it is found that half a tablet of asperin added to two quarts of water greatly helps *Chrysanthemums* and *Dahlias* but fails to do much for other blooms.

The *Chrysanthemum* can also be grown in the ground, in specially prepared beds, at a distance of 2 to 3 feet apart and helped to grow on as above, with liberal feeding. For a general effect, where the size of the flowers is not the chief consideration, more buds may be allowed to remain on the plants.

Sometimes a white maggot attacks the roots of the plant, and in consequence, the leaves turn yellow and the plant looks sickly. In such cases, it should be removed from its place, and the roots carefully examined, and the plant replanted in entirely fresh soil.

There are several classes and innumerable varieties, distinguished by shape, size, earliness, etc. Some varieties grow tall and are benefited by "pinching back"; an inch or so of the top of the growing shoot is pinched out by means of the finger and thumb, causing the plant to branch out from below. If fine, bushy plants are desired, this pinching back is repeated with the other shoots as they come up. By judiciously timing the transplanting operation of the different varieties, and pinching back the shoots or omitting it as need be, the flowers could be had a few weeks earlier or later, as desired.

The Annual Chrysanthemums are quite different from the above, and like other annuals are very easily grown from seeds. In places with light rainfall, the seeds could be sown during the monsoon, but they do best if sown soon after the rains are over, in which case they bloom during the winter. The single flowers are very pretty, resembling coloured *Marguerites*, and deserve to be grown more.

COSMOS (MEXICAN ASTER).

(*Cosmea bipinnata*.)

One of our most easily grown annuals. Tall-growing plants with elegant, feathery foliage, and white, pink, rose, crimson and purple flowers.

Being very hardy, it stands heavy rains and heat and can be successfully grown at almost any time of the year, except the winter in Northern India. The best time to grow is during the rains. Sow at the commencement of the rains and transplant at a distance of 18 to 24 inches. In ordinary soils it will grow to a height of 3-4 feet but in rich soils it will grow about 6 feet high. During the winter, the growth is not so luxuriant and the plants should be put down closer together. It can also be sown at the end of the cold weather, when it will flower during the summer. On the hills, sow from May to July. In Southern India, on the plains, the best time is September-October.

Sometimes owing to "forcing" weather or unsuitable soil, the plants may begin to bloom very early while yet quite small. Remove all flowers and buds. Stir the surface gently and give a top-dressing of manure. This will stimulate the plants which will then flower quite satisfactorily. The plants will need bamboo-stakes or some kind of support, as they are likely to be blown down by strong winds.

Usually, the *Cosmos* is not as impatient about coming into bloom as most annuals, but waits until it has made its growth before expending its energy in flower production. The early-flowering class is useful on hill stations, as it blooms in the summer before the Autumn frosts occur. The Double or Crested *Cosmos* is a recent development of this popular annual; instead of the yellow centre which shows in the single varieties, these have a double or crested, raised centre. Some flowers may be perfectly double. This new type is not yet quite fixed and some plants produce single flowers.

DAHLIA.

The *Dahlia variabilis* of the celebrated botanist Linnæus is a tender, tuberous-rooted perennial, and is one of the most beautiful of our flowering plants, useful alike for cut flowers as for giving colour and richness to the garden. It is one of the latest to be brought under man's influence and developed into cultivated forms of unparalleled beauty and variety. Few plants have yielded so much to the skill of the florist. Nor have the limits to the Dahlia's capacity for variation in form and in colour been reached. Any careful garden-lover may confidently expect to produce further changes.

The history of its introduction into Europe is very obscure. **ITS HISTORY** Baron Humboldt, a Prussian naturalist and explorer is generally believed to have first discovered it in Mexico in 1789. He sent it to Professor Cavanilles of the Botanical Garden at Madrid. It was the latter who named the plant **Dahlia**, in honour of Professor Andreas Dahl, a Swedish botanist and a pupil of Linnæus. This name is, however, not recognised by all botanical nomenclaturists; for many years the genus bore the name "Georgina" on the Continent of Europe, and this appellation is still adhered to in Germany by many leading horticulturists.

While at Madrid and soon after they were received from Mexico, **IN ENGLAND** they attracted the attention of the Marchioness of Bute, wife of the British Ambassador to the Spanish Court. The plant was introduced into England by her the same year, but as its treatment was not understood, it did not thrive till four years later, Fraser, a London nurseryman, gave it a thorough trial. He cultivated the crimson species *Dahlia coccinea*, and was successful in getting the plants to flower. Then again in 1804, Lady Holland brought over some seeds from Spain and at Holland House, Kensington, from the time their proper treatment was known, the art of the gardener supplemented the work of Nature, and it began to unfold its great possibilities.

The Dahlia also received great attention in France, Spain and **ON THE** Germany, and it is still prized there as one of the finest **CONTINENT** of summer and autumn flowering plants. In the South of France where the conditions are even more genial, it soon became very popular, and within a year or two of its establishment in the gardens of the Riviera, the plant had well upheld its specific

name of *variabilis*; the catalogues issued at the time give long lists of named varieties differing widely in colour. The prevailing shades seem to have been red, orange and yellow.

Although other species were discovered in and introduced from Mexico, it is remarkable that they should not have hybridised the varieties established in Europe and, the *Dahlia Coccinea*, Cav., continued to remain the favourite. Gradually, however, both the *Dahlia variabilis* and the *Dahlia coccinea* broke into numerous colours and became general favourites. Botanists and gardeners have since produced varieties too numerous to mention.

The history of the introduction of the Dahlia into India is very obscure. Reference to several writers has failed to yield any reliable information. There is reason to believe, however, that it was introduced into India from England about sixty-five years ago.

The original plant bore single flowers with eight ray petals, narrow, sharply acuminate and notched at the end, and with wide spaces between the tips of the rays, giving the flowers a star-like appearance. The tendency to produce double flowers appeared soon after the Dahlia became domesticated in European gardens, but it was not until quarter of a century later that a pronounced departure towards the double form was attained, the first double Dahlia having appeared in 1814. In another 50 years the Dahlia was in the front rank of garden plants. To-day it is still growing more in popularity as its capabilities are being developed.

When the Dahlia was introduced into British gardens, public taste was inclined largely towards primness and formality. The perfectly double, ball-shaped Dahlia was therefore not long before it became the flower of the day, usurping in public estimation, the place of the Auricula and Tulip. The original double form was called the "SHOW"—a formal, round, stiff, double flower. Next came the "FANCY" type, a section of the foregoing variety with variegated flowers. The "POMPON" type is the same as these in form and colouring but much smaller in plant and flower and yields flowers more abundantly. It was originally developed in Germany early in the last century and was introduced in English gardens as late as about a quarter century ago.

The reaction against formalism in horticulture, which first manifested itself a little more than half a century ago, affected the Dahlia also and, for some years it suffered comparative neglect, only to come forward later and achieve an increased popularity. This new interest in the Dahlia was awakened by the introduction of the "CACTUS" type, a development of the *Dahlia Juarezii* introduced from Mexico. A brilliant scarlet in colour, in form it was a composite of the "Cactus" and "Decorative" types of to-day, with foliage more finely cut than the older type; a plant of more slender and taller habit. "Cactus" is hardly the best name for the beautiful flowers of this variety, as there is, besides their spiky petals, little in them to suggest that formidable thorny growth so common in this country. The informal outlines of this type, its wonderful range of colouring, in self colours as well as richly varied blendings of two or more shades, gave a tremendous impetus to Dahlia culture and awakened an interest, which is world-wide and of growing influence. The first Cactus Dahlia is said to have been grown at Utrecht about 40 years ago, from seeds from Mexico. Accordingly it bears the name of its then President, Don Juarez.

The plant became a favourite, Dahlia Societies sprang up, and the autumn Dahlia fêtes became the chief events of the gardening year. The Dahlia came to Europe in times of stress and change. It changed with the change of fortunes in Europe—the French Revolution, the Napoleonic wars, etc. contributed as it were to its fame for instability. Even from a botanist's or florist's point of view, this may be accepted, as there is no plant more unstable in our gardens. But we have no reason to lament this fact but rather to welcome the tendency to variation, as this gives us something new every season.

The Dahlia belongs to the *Compositæ* family, which have flower-heads which consist of many florets or a composite of flowers; thus the essential organs which produce seeds are somewhat difficult to reach and do not readily set seeds. Their inability to produce seeds is supposed to be due to what is known as self-incompatibility or self-unfruitfulness. Thus the same variety is not able to fertilize itself. There may be some exceptions but this seems to be the general rule in the highly developed modern types of Dahlias. Thus if a certain variety has to produce seeds, it must be fertilized by a different variety. This factor seems to be the chief cause of the instability of the Dahlia. Seeds collected from perfectly well-formed double flowers will produce quite a number of semi-double and single blooms.

Dahlia cultivation is very simple. It thrives in almost any soil, but where a choice can be made it is best to select a rather light, well drained and moderately rich soil. Heavy soil, with a clay sub-soil, should be avoided. Such a soil can be improved by adding to it very liberally, coarse coal ashes and sand, and mixing these into the soil to a depth of about 12 to 18 inches. For the best development of the Dahlia, a moderate rainfall which is well distributed during its growing and flowering period, and a mild climate with moisture in the atmosphere, seem to be necessary.

For the successful cultivation of Dahlias, an open, sunny situation away from large trees such as would shade them or rob the soil of its fertility and moisture, is necessary. Dahlias do flower under partial shade, but the best results are obtained in a sunny situation. Care should be taken to protect them from heavy winds, as their tops are generally heavy and brittle, and have a tendency to snap off if not protected by a wind-break or held up by heavy stakes, to which they should be firmly tied. It may also be added that Dahlias are particularly adapted for seashore cultivation, because of the moisture and heavy dews which collect in such places during the nights. They need moisture at the roots, but it should not be excessive, otherwise the roots are likely to decay. For this reason they should not be planted in low places unless well drained, as continuous rain of a few days' duration is likely to kill them.

When large, healthy bulbs are planted in a good soil, which retains water for a considerable time, watering is not required frequently and should only be done when the plants show signs of wilting. They must, however, be watered copiously so that it penetrates to a depth of at least about a foot. It is a very good plan to stir the soil to a depth of one to two inches the day after watering, and carefully pulverizing it later, to preserve the natural moisture in the soil and prevent rapid evaporation. In some localities and soils, it may be found necessary to water almost daily, as the Dahlia is very susceptible to droughts, and should not be allowed to flag for want of water at any time during its growth. Constant stirring of the surface

soil and keeping it free from weeds is also very important and is one of the chief factors of success.

While Dahlias will adapt themselves to almost any soil, it may be well to state that a good sandy loam is especially adapted to their culture, owing to its drought-resisting qualities. **MANURES** As the Dahlia is a strong, robust grower, it is not particular about the form of manure or fertiliser it gets, provided the necessary elements required for its development are there. Any well-rotted manure will give good results, if a sufficient quantity is well-worked into the soil. Barn-yard manure, horse or sheep manure are all suitable. The manure should be spread on the surface about three inches in depth, and spaded into the soil. Should it become necessary to use an artificial fertilizer to stimulate growth, or with a view to get extra-large flowers, it should on no account be used during the early stages of the plants' growth. The best time to do this will be when they are coming into bloom.

Frequent doses of liquid manure, are also beneficial when the plants begin to bloom. A small handful of pure Bone Meal and Nitrate of Soda, in the proportion of four to one; or a mixture of Ammonia, Superphosphate and Potash mixed in about the proportions of 4-10-6 is found to greatly stimulate the plants. Use at the rate of about 1 to 1½ lbs. per plant. Do not allow it to come in direct contact with the plants, but sow it in the ground and rake it in. Watering will dissolve it and wash it in.

It sometimes happens, however, that the soil is virgin and very rich. In such soils, manure is not necessary. In soil which is too rich, the plants will abound in leaves and will not produce satisfactory flowers.

Dahlias are grown either from seeds or by division of the roots, or by cuttings. It is very interesting to grow them from seeds, as many new varieties are likely to be thus obtained. **PROPAGATION** The seeds are best sown in a mixture of fine, light soil and well-decayed cow or horse manure in equal proportions. As they are susceptible to moisture, it is a good plan to first level the surface of the soil, soak it with water and to sow the seeds either broad-cast or in drills, distributing them so that they are not less than about half an inch from each other. Then cover them with a layer of about half an inch of fine sand. Water sparingly at first. It must not be forgotten that on account of its inherent qualities, Dahlias do not come true from seeds and show great variation in results.

The ease with which a large number of plants can be quickly raised at a small expense, and the fact that they bloom from seeds within four months' time, commends this method to many. Those, however, who desire to grow only a limited number of the best varieties, should grow them from roots. All our modern named varieties are grown from division of the roots. As the "eyes" (or buds) are not on the individual tubers, but on the crown to which the tubers are attached, care must be taken that each division has at least one eye. When the roots have grown for a season or two, they greatly increase in size and can be easily divided into two, three or more divisions. This is usually done at planting time as then the tubers begin to show the "eyes" and can be easily divided, and planted soon after.

The classification of the Dahlia is not very exact and due to the large number of forms and diversities in shape, it may be rather confusing to the amateur. **CLASSIFICATION** There are many varieties which different florists would class under different heads. As already mentioned in the history of this plant, the Dahlia as it grew in its natural home was a single flower.

The development of the *Double*, *Pompon*, *Fancy* and *Cactus* types has also been described. *Double Tom Thumb* and *Single Tom Thumb* or *Pigmy* Dahlias grow only to a height of from 12 to 18 inches and produce numerous medium-sized flowers. They are suitable alike for bedding and pot culture. *Decorative or modern* Dahlias are mid-way between the Cactus and the Double. The form is double, mostly flat, but of good depth; petals rather irregular, long, broad, flat and nearly straight. The name is well chosen, as the plants are truly decorative, bearing well above their foliage, their large, handsome flowers, in great profusion and in innumerable shades of very beautiful colours. The *Collarette* Dahlia is a single flower of great beauty and is characterised by a row of smaller or collar petals round the centre. These collar petals are generally distinct in colour from the rest of the flower,—a fact which adds greatly to their beauty. *Century* Dahlias are a later development of the single flower in which the petals are broad and very regularly placed and the flowers are of huge size. This class was once popular only about 20 years ago in America, but European florists have not recognized it. The *Single Cactus* is another form of the single Dahlia. The petals are long, narrow and irregular, sometimes twisted at the tip. The *Paeony flowered* or *Art* Dahlias, though of very recent introduction, have created a sensation in the floral world. The flowers are semi-double, having two, three or more rows of broad, flat, loosely arranged petals, usually surrounding a conspicuous rich golden-yellow centre. The petals are often pointed, sometimes twisted, and in some varieties the inner row of petals twists and curls over the centre, giving the appearance of the Japanese Pæony. Hence its name. The blossoms are very effective and graceful, usually of a large size, and borne on long, stiff stems, making themselves very useful for bouquets, and as cut-flowers. The plants also are of a very vigorous growth and taller than most other classes. Besides the above, there are classes such as *Anemone-flowered*, *Star*, *Rosette*, *Colossal*, *Semi-Paeony* or *Duplex*, *Pompon-Cactus*, etc., but they are less important, and not so universally recognized.

The Dahlia is also largely grown as a pot plant, but the size of the pots must be large. The roots usually sold by seedsmen and florists, are of a small size, suitable for sending out to distant places as they travel well and economically and are known to produce as good flowers as large field-grown roots. As a matter of fact, the size of the tubers has little to do with the quality of the blooms. These small bulbs are very suitable for growing either in pots or in the ground, and under proper treatment, they are quite satisfactory. When planting, cover the bulbs with soil to a depth of about 2 to 4 inches from the top. After one or two seasons' growth, the roots will increase to a very large size and can be easily divided as already described. In India, especially on the plains, it is generally found that the choice varieties deteriorate after two or three years and need to be replaced by imported bulbs.

As Dahlia plants are generally very brittle, they break when exposed to winds, and they need the support of strong bamboo or wooden stakes. But if the following plan is followed, it will be found that very little staking is required. When the shoots appear above the ground, remove all but the strongest one, and when this has made the height of about 12 inches, or rather has made at least two sets of leaves, pinch out the top, leaving two sets of leaves. This will induce it to put forth branches from the base, near the soil, and so make a more sturdy plant, better adapted to withstand winds.

If giant sized flowers are required for exhibition purposes, remove all but a few branches, and as soon as buds begin to
EXHIBITION form, feed up the plants either with liquid manure or
BLOOMS some other artificial stimulant. The buds are usually produced in threes. In order to direct all the energy into the centre one, the two outer ones should be removed as soon as formed. When the bud opens it will most likely be necessary to protect it from the sun by a hood, as some colours are easily injured by direct sunlight. The buds should also be protected from heavy rain.

All flowers are best cut late in the evening, or better still, early in the morning. Strip off a portion of the foliage
KEEPING FLOW- from the bottom of the stem, six inches or so. Plunge
ERS FRESH the end of the stems in boiling water for 30 seconds, then place in cold water. If half a tablet of asperin is added to the water, it further helps the flowers to keep fresh.

Freshly cut flowers are a source of delight in any home, but at the same time they often are a trial and disappointment to the house wife because of their short life. This situation
FURTHER can be remedied somewhat by proper handling of flowers
SUGGESTIONS after they have been cut.

Pure, fresh water every day, kept at as low a temperature as possible, will do wonders. In addition, the practice of cutting off a bit of the stem each day aids in keeping the flowers alive.

Poppies, Heliotrope, Mignonette, Dahlias and Poinsettias will keep best if about an inch of the stems are plunged in boiling water shortly after they have been cut and are then placed in cold water. Hot water seals the ends, prevents the sap from flowing downwards and permits absorption through the outer surface of the stems in parts higher up.

Chemicals such as charcoal and asperin disinfect the water and consequently can be used as an aid in keeping flowers fresh. It has been found that the use of a 0.1 solution of boric acid (one in ten parts) will improve the keeping quality of Carnations three to seven days. Half a tablet of asperin to two quarts of water helps Chrysanthemums and Dahlias, but fails to do much for other blooms. One teaspoonful of cane-sugar to one quart of water will do much to freshen Asters.

Dahlias are remarkably free from insects and diseases. But they are occasionally attacked by mildew when their environment is not satisfactory, and they have received a setback from some unfavourable condition. This condition
INSECTS AND should be treated in its very early stages. An application of Copper
DISEASES Sulphate Solution or any standard fungicide, twice a week for two or three weeks, will be found very effective. But if the mildew has spread heavily, it will not yield to any treatment, and the best thing to do is to cut down the affected plants to within a foot or so of the ground and start an entirely new growth. If the plants are given an open situation and are kept growing by liberal and judicious watering and feeding, the new growth will be perfectly healthy.

Green Fly or Aphis will also sometimes attack the plants if their vitality is lowered. These are found on the underside of the foliage. A liberal use of tobacco dust, or spraying with tobacco water will soon destroy them.

Slugs, earwigs and beetles also sometimes attack them ; but these insects are never numerous and if a careful watch is kept, they can be easily destroyed by hand. Slugs usually work at night and so must be searched for with a lamp at night. By leaving cabbage leaves about among the plants, the slugs may be induced to hide under them during the day time and thus can be easily discovered and killed. Earwigs seek shelter, during the day, in pots filled with hay or dry moss, and can be caught in that way. Soot is also a very good preventive and may be used liberally.

Cutworms also are destructive, especially of young shoots. A liberal sprinkling of air-slaked lime will discourage them. Even if some of the shoots have been eaten by them, more will readily form. The grower, however, need not be afraid of the above long list of pests, as it is seldom that they are really troublesome and hardly five in a hundred growers have any trouble with them.

CARE OF DORMANT ROOTS The Dahlia has a perennial root but an annual stem. The plant dies down to the roots every year and starts a fresh growth at the proper season, after a few months' rest. We have described the Dahlia as a tender perennial; it is tender only in the sense that it cannot stand even a few degrees of frost. In places where frosts occur, the plants are killed by frost at a time when they have nearly finished their season's growth. After the tops have been entirely killed by frost, the roots should be carefully taken out of the ground. They should be freed from soil and dried in the sun for a few hours. After packing them in dry sand or saw dust or some such material, they should be stored until the next planting season, in a dry, cool cellar. Care should be taken to avoid the use of tin boxes, as they prevent air reaching the roots, thus killing them. Old deal-wood cases are eminently suited for this purpose. The wooden cases must be carefully closed down so that mice cannot get into them easily.

TIME OF PLANTING Our thanks are due to the Superintendents of Government Gardens, Allahabad, Bangalore, Ooty, Pachmarhi, Trivandrum, Narsingpur, Maymyo, Benares State, Lucknow, and to the Agricultural Inspector, Khashi and Jaintia Hills, Shillong ; The General Overseer, Arboricultural Works, Dacca ; Superintendent, Municipal Gardens, Bombay ; Secretary, Cawnpore Memorial Well Gardens, Cawnpore ; Superintendent, Agri-Horticultural Society's Gardens, Teynampet, Madras ; Director of Gardens, Kapurthala State ; Manager, Kanauli Gardens, Muzafferpur ; Director, State Gardens, Gwalior State ; Curator, Lloyd Botanic Gardens, Darjeeling ; Messrs. Dijon & Sons, Ghatsila ; The Secretary, Agri-Horticultural Society of India, Calcutta ; The Curators of Botanic Gardens, Nuwara Eliya and Peradeniya, Ceylon, Director of Agriculture, H.E.H. The Nizam's Govt. Hyderabad, and others who have supplied us with valuable information especially about the time of sowing seeds and planting bulbs etc., not only of the Dahlia, but also of Cannas & Gladioli. The information given below about the time of planting in various parts of India, is culled from their letters with slight modifications.

DAHLIA (Continued.)

Places.	Time for sowing seeds	Time for planting bulbs.	Period of flowering.	Remarks.
Deccan, Konkan & Southern Mahratha Country.	Middle of May to end of June	June-July	Aug.-Oct.	Thrives very well and flowers satisfactorily.
Deccan Hyderabad	May-June	June-July	Within 3-4 months	Thrives well with ordinary care
Bangalore and vicinity.	"	May-June	Aug.-Oct.	Thrives well and flowers satisfactorily.
Madras (plains).	Sept.-Oct.	Oct.-Nov.	Dec.-Jan.	Does fairly well.
Nilgiris and Hill stations of S. India	Feb.-March.	March-April.	June-Sept.	Flourishes luxuriantly and flowers freely.
Travancore.	March	April-May	June-Aug.	Does but moderately well.
C.P., C.I., U.P., & Punjab (plains).	Aug.-Sept.	Sept.-Oct.	Late winter and early spring.	Does not thrive well on account of the great heat from July to October. Where heat is not great and where rains fall during these months, they may be sown earlier during the monsoon, otherwise as indicated in 2nd and 3rd columns.
Pachmarhi and Hill stations of C. P. and C. I.	June-July	June-July	Aug.-Oct.	Thrives well and flowers satisfactorily.
Narsinghpur.	June	April	Within 3-4 months.	" " "
Lucknow.	May	July	After 5 months.	Does not do very well, and takes long to bloom.
Benares.	Sept.-Oct.	Sept.-Oct.	After 3-4 months.	Does fairly well.
Gwalior.	June-July	June-July (for early flowering). Also Nov.	"	Does not do very well.
Dacca and vicinity.	Sept.-Oct.	Oct.-Nov. (Also July for early flowering).	Early winter.	Does fairly well.

DAHLIA (Continued.)

Places.	Time for sowing seeds	Time for planting bulbs.	Period of flowering.	Remarks.
Tirhoot Division (Muzaffarpur).	Sept.-Oct.	July.	Within 3-4 months.	Does well but requires much care and right treatment. (Bulbs, if not already sprouted, should be started by covering them with soil and watering them.)
Dum Dum and Ghatsila.	April-June and also Sept.-Oct.	Sept.-Oct.	After 3-4 months.	Does very well and flowers satisfactorily. (Better results are obtained from the second sowing (of seeds) than the first).
Calcutta.	September	September	"	Does well and flowers satisfactorily.
Hill stations of Northern India.	March-April	March-April	All through summer.	Thrives well and flowers satisfactorily.
Burma and Assam. (Plains)	Early rains.	Early rains.	Within 3-4 months.	Thrives in places where there is neither an excessive rainfall nor great heat, during the monsoon.
Darjeeling.	March.	Dec.-Jan.	After 3-4 months.	Does very well and flowers satisfactorily.
Hill stations of Burma and Assam.	Jan.-May.	Jan.-May.	Within 3-4 months.	Thrives well under proper treatment. Time varies according to elevation and climatic conditions.
Maymyo.	May.	April-May	"	Does exceptionally well with ordinary care.
Shillong.	January	February	"	Thrives well and flowers satisfactorily.
Peradeniya.	May-June	Oct.-Nov.	"	"
Nuwara Eliya.	"	Dec.-Jan.	"	"

DELPHINIUM (Perennial Larkspur.)

Nat. Ord. *Ranunculaceæ*.

All plants have charm, more or less. With some we must seek them, with others we find them at first glance. Delphiniums are the leading favourites of those who love hardy flowers, because they have virtues of unusual merit. Stateliness in appearance, massiveness in form and brilliancy in effect, are a few of their recommendable features. Their greatest charm is the loveliness of their shades which are unapproached by any other flower, and range from the palest blue and lavender to the darkest indigo and violet. The newer forms with immensely large flowers and bee-like centres, are remarkably striking.

The stately spikes will grow from 4 to 6 feet tall according to variety, and if cut back immediately after blooming, a second crop of smaller shoots will soon appear. On no account, should faded flowers be allowed to remain on the plants.

Unfortunately the Delphinium is a little difficult to grow from seeds, as its germination is usually uncertain. In India, it seems that the best time to sow, either on the plains or on the hills, is from September onwards. In places with light rainfall, it may be sown at the beginning of the rains. The seeds take about 3 weeks, or sometimes more, to germinate and should be very carefully transplanted either singly in large pots or in well-prepared, deeply dug and well-manured ground, at a distance of about 2 feet apart each way. They are known to bloom almost everywhere on the plains of India but on account of the higher temperature or heavy rains, the plants do not survive long. On the Hills, they will live for years and increase in size. The *Chinese* Delphiniums are small growing, quick flowering plants and are grown as annuals with good effect. The *Belladonna* and the other new hybrid types which are truly perennial by nature, also flower the first season from seeds. In favourable weather they thrive better in the open, but during summer, they should be protected from the afternoon sun. It is recommended that growing plants be frequently nourished with either liquid manure, bone meal, or any stimulating fertilizer. Roots of old plants may be divided and replanted in fresh soil. But it is advisable not to disturb the plants for at least three years, after which they may be taken up, divided and replanted in fresh soil.

GLADIOLUS.

This is a herbaceous plant growing from a solid fibrous-coated bulb (or corm), with long, narrow, plaited leaves and a terminal one-sided spike of generally bright-coloured irregular flowers. There are about 150 known species, a large number of which are South African, but the genus extends into tropical Africa and as far north as Central Europe and Western Asia. One species *G. illyricus* is found wild in England. But no species is known to have been found in India. Some of the species have been cultivated for a long period in English flower-gardens, where both the introduced species, and the modern varieties bred from them, are very ornamental and popular. *G. segatum* has been cultivated since 1596, and *G. byzantinus* since 1629, while many additional species were introduced during the latter half of the 18th century. One of the earlier hybrids originated in gardens was the beautiful *G. Colville* raised in the nursery of Mr. Colville of Chelsea in 1823.

In the first decade of the 19th century, however, the Hon. **ITS EVOLUTION** Rev. W. Herbert successfully crossed the showy *G. cardinalis* with the smaller but more free flowering *G. blandus* and the result was the production of a race of great beauty and fertility. Numerous other crosses were made, but it was not till after the production of *G. gandavensis* that the gladiolus really became a general favourite in gardens. This fine hybrid was raised in 1837 by M. Bedinghaus, gardener to the Duc d'Arenberg at Enghien. Since that time innumerable varieties have appeared, only to sink into oblivion upon being replaced by still finer productions.

The modern varieties of the gladiolus have almost completely driven the natural species out of gardens, except in botanical collections. The most gorgeous groups—in **MODERN TYPES** addition to the *gandavensis* type—are those known under the names of *Lemoinei*, *Childsi*, *nanceianus*, and *brenchleyensis*. The latest addition to these groups is the *Primulinus* type, which was discovered a few years ago near Victoria Falls, South Africa. It was very floriferous, hardy and bore the purest yellow flowers known among gladioli. The hybridisers were quick to realise the possibilities of this type and having crossed it with various allied species and choice garden varieties, produced a class which is now very popular everywhere.

The flowers of the best varieties are of great size and substance, often measuring 7 to 9 inches across, while the range of **AS A CUT FLOWER** colour is marvellous, with shades of grey, purple, scarlet, salmon, crimson, rose, white, pink, yellow, etc., often beautifully mottled and blotched in the throat. The plants are vigorous in growth, often reaching a height of 4 to 5 feet. The stately habit and the rich glowing colours of modern gladioli render them exceedingly valuable as decorative plants in the garden. They are also very desirable and useful for the purpose of room decoration, for while the blossoms themselves keep fresh for some days, if cut either early in the morning or late in the evening, the undeveloped buds open in succession if the stalks are kept in water, so that a cut spike will go on blooming for some time.

The Gladiolus is a flower of very easy culture and does well in any soil, but should have full exposure to the sun. When **CULTIVATION** setting the bulbs, they should be covered at least with 3 to 4 inches of soil or even more, so that the new bulb, which forms on the top, will not be pushed too near the surface. Care should be taken to plant the bulbs right side up. On account of the small space the plants occupy, they can be planted very close. Where a large number is to be grown, either for mass effect or for cut-flowers, the bulbs may be planted as close as 2-3 inches apart in rows 6-8 inches apart. They can also be grown in small pots which may be brought inside the house when the blooms appear.

Being very responsive to liberal treatment, giant exhibition blooms can be obtained by giving them the best soil, cultivating **MANURING** it well and deep, and enriching it with the richest farm-yard manures, which must, however, be thoroughly decomposed. Liquid manure or pulverised sheep-manure can be applied to the soil once every week or ten days with advantage. The soil should be well-worked frequently, never allowing a crust to form on the surface. Water copiously whenever necessary, and stir the soil the day after watering.

Do not work the soil when wet. Prepared ground-bone or any other high grade fertilizer, can be sprinkled over the soil near the plants, between rows, and raked in, to good purpose. Nitrate of soda (about a table spoonful to 2 gallons of water per dozen plants) applied to the soil near the rows once every week or ten days after buds begin to show, is very beneficial. Or sprinkle the pulverised Nitrate of soda over the soil, rake in, and water.

The Gladiolus usually takes about three months or even less to bloom, according to variety and climate. It is advisable to remove the flower spikes as soon as they begin to fade, leaving a few leaves near the stock. When the leaves turn yellow, water should be gradually withheld and when perfectly dry, the bulbs should be carefully lifted, dried in the sun for a few hours, and then stored carefully like Dahlia tubers till next planting-time.

Only those who have seen Gladioli at their best can realise the vast difference between those produced by first-class methods, and those more or less left to grow by themselves. To obtain a continuity of succession of blooms, bulbs should be planted at intervals of every ten days.

The Gladiolus is easily raised from seeds, but takes from 2 to 3 years before it attains a flowering size. The named varieties are, however, propagated by means of the bulblets or offsets or "spawn" which grow round the parent bulbs.

TIME OF PLANTING The best time of planting is about the beginning of the rains in places like the Deccan and Konkan. The Gladiolus is known to stand heavy rains, even upto 80 inches per year if planted in light, well-drained soil. In Bangalore, the bulbs are generally put down about the middle of May. On the Nilgiris, in March-April. In Madras, Gladioli have not been known to do well. In East Bengal, planting is best done in August-September, and sometimes again in November-December. On the Hill Stations of Northern India, during February-March, and on the plains about October-November.

GLOXINIA.

The treatment of the Gloxinia is more or less on similar lines to that of the tuberous-rooted Begonias. They are best grown in pots in a conservatory or fern house, and with care can be grown during the rains in places with even fairly heavy rainfall like Bombay or Calicut.

NASTURTIUMS.

(*Tropaeolum Majus*. INDIAN CRESS).

There are few flowers which grow so easily or will repay the small amount of labour in planting with such a gorgeous and continuous display of blossoms as the Nasturtium. Wherever grown, it has been a great favourite, and is wonderfully effective when planted in masses or in long rows on the lawn, and are very desirable for use in baskets or vases, elevated boxes, tubs, etc. They can also be grown as pot-plants during winter months. The climbing Nasturtiums are particularly useful as screens by growing them on fences, and produce brilliant flowers in a short time. As cut flowers also, they are quite satisfactory.

The Nasturtium is not particular as to soil, requiring only an ample supply of sunshine and good drainage. In shady places or in too rich a soil, it is apt to run to more leaves and few flowers.

Where the rainfall is light—say not over 25 or 30 inches—they can be grown during the rains; also during the cold weather, which is the best time. In the Punjab and in other places, where the nights are very cold and where frosts occur, it is necessary to protect the plants with some covering in the nights. In the hills, sow seeds in succession from March to May.

The Dwarf or Tom Thumb varieties grow in compact, round little bushes and make very satisfactory plants for bedding. As they do not stand transplanting well, the seeds should be sown direct in prepared beds of moderately rich soil, at distances of about 9 to 12 inches, putting down two seeds in each hole about an inch deep, and pressing down the soil firmly over the seeds. As soon as the young plants are well above the ground and have formed two or three leaves, the soil should be worked with a hoe or similar implement, making the surface fine and loose to a depth of about two inches, and the young plants should be thinned out to stand only one in a place. Nasturtiums are liable to damp off or rot in wet seasons, if allowed to stand too closely together, and should be thinned out as soon as large enough to be easily handled. The beds in which they are grown must be made a little higher than the surrounding level, so that all extra water may drain away.

The Tall or Climbing Nasturtiums have no tendrils with which to clasp the support and hold the vines closely to it, such as in the Sweet Peas, but will twine and interlace their running branches over palings of the common garden fence, or meshes of wire netting, or they run rampant over ordinary pea brush, (twiggy branches of trees or of bamboos) such as is used for garden peas. An effective method of displaying their bright flowers is to lay brush over the flower-bed when the plants are three or four inches high, and to allow the vines to twist and climb at will through the brush, which they soon conceal from view. Where open wire or light iron fences are used, a space about a foot wide is prepared alongside the fence, and planted with a single or double row of Climbing Nasturtiums. Treated in this way, besides making a beautiful display, they make a pretty edging to the lawn. Planted in tubs or boxes, they can be grown either by themselves, or a few seeds can be stuck in between the plants of Geraniums, Coleus, etc., for the vines or branches will run among the plants, concealing the soil, and then hang their long branches gracefully about the sides, and blossom freely. They are also effective when grown in pots on stands, or as hanging-basket plants or in vases.

Both the flowers and young tender leaves of the Nasturtium (which have a delicately pungent flavour similar to that of Mustard or Cress), are gathered and used in making delicious sandwiches, in the same manner as Lettuce is. The seeds, gathered while still green and tender, can be made into very appetising pickles. Even the flowers can be employed in decorating the Salad-bowl, because they are not only ornamental, but edible.

The Canary Creeper (*Tropæolum Canariense*) is a distinct variety, and makes a very beautiful small creeper with its fairy-like flowers, which are produced in great abundance if the plants are given a rich and deep soil and a cool season to grow in.

PANSIES.

Viola tricolour maxima.

The Pansy produces the largest and finest flowers in a rich, loamy soil, and in a cool, moist climate. In hot, dry weather, the plants deteriorate quickly and produce small and inferior flowers. The seeds should be so sown that the plants flower during the most favourable season.

The Pansy is a hardy perennial in cold countries, and in favourable localities, flowers for many months continuously, producing large, bright coloured blooms. It is also greatly improved in recent years and many new and very charming shades of colours have been added and the size of the blooms also greatly increased. It is a great favourite with everyone and gives satisfactory results in all parts of India with a moderate amount of care.

It is adapted both for bedding out and as a pot plant. Being a cool weather plant, the seeds should be sown in September or October, so that the plants may bloom during the cold weather. In places where October is too hot, sowing may be deferred till November. On the hills, sow from March to May, and also in Autumn.

The chief essentials for best results are, good, rich, loamy soil that will hold moisture well; frequent cultivation; removing faded flowers from plants so that they do not form seed-pods; cool, partially shady position and frequent applications of liquid manure or bone-meal.

Like many other flowers, the young plants (seedlings) should be transplanted twice before they are finally set out to flower in their permanent quarters. The plants should not be allowed to crowd, or they will become lanky or spindly. Even a third transplanting should be done if necessary. When the plants make good and healthy growth before producing flowers, they give best results. In warm weather or in exposed, dry or poor soils, the plants are apt to bloom early, producing small, indifferent flowers. A good mulch of manure on top of the soil, keeps the roots cool and benefits the plants.

When bedded out, the plants may be set at a distance of about 9 inches apart each way. When the plants have flowered for some months, they will show signs of exhaustion—the flowers will be smaller in size, the branches long and slender. If, at this time and before the plants have exhausted too much, the long old branches are cut back very nearly to the roots and the soil stirred and given some liquid manure or a mulch of any good well-rotted manure, fresh branches will be produced and the plants will again flower for some time more.

PETUNIA.

This most pleasing annual may be fittingly described as everybody's flower. It succeeds everywhere, even under unfavourable conditions, and no garden, however small, is complete without it. Given a sunny location, it can always be depended upon to furnish blooms in abundance, all through the cold and part of the hot weather.

The seeds are very small and need to be sown carefully. The tall class grows to a height of 18 inches or a little more and the dwarf about a foot high. They are grand as bedding plants and are also suited for growing in boxes, vases and hanging baskets. The *grandiflora*

fringed and double varieties are simply superb and should be grown in every garden. The Double Petunia seed is generally obtained by hand-fertilization and as the double flowers are sterile, the single flowers are crossed with double and bear seeds. Thus, when even the choicest double seeds are grown, some plants are bound to be single. While transplanting, care should be taken not to discard week-looking seedlings, as, generally, these produce the best and double flowers.

The Petunia flowers best during the winter on the plains and the seeds should be sown at the end of the rainy season—say September-October. Being very hardy and able to withstand sun and heat, it can also be sown any time during the cold weather when it will bloom in the summer. As it cannot stand heavy rains, it is not advisable to try it in the rains, unless the rainfall is very light—say not more than about 25 inches. On the hills, sow from March to June and also in October.

The seedlings, as soon as they are large enough to be easily handled, should be transplanted at a distance of about a foot apart or one plant to a medium-sized pot or basket. The tall Petunias have a natural drooping habit and so are well suited for growing in boxes or baskets. Choice plants of large flowering or double Petunias can be multiplied by cuttings like the Geranium or Verbena—as it is not a strictly annual plant but a biennial. When grown in pots, it is a good plan to use small pots at first and to shift the plants into larger ones as they grow.

Petunias have also been greatly improved in recent years. The advance is not only in the line of colours but also size, and we have now nearly clear blues not found in the Petunia before. The deep, rich purples and violets are superb; the light pinks are dainty; the whites are showy; the striped sorts are fantastic; the giant doubles are marvels of the breeder's art, and the frilled sorts are popular. Altogether, the Petunia is a very satisfactory flower.

PHLOX.

The brilliance and clean colours of the annual Phlox (*P. Drummondii*), make it a favourite in every garden. No other flower can compare with it in variety of colour and profuseness of bloom. The flowers range from pure white to pink, primrose, scarlet, crimson, rose, lavender, purple. Some are perfectly clear, while others have dark or white eyes. The plant keeps on blooming for months and furnishes quite a large quantity of flowers for cutting, as the plants branch freely and continuously produce new blooms. The flowers also last well in water.

It thrives best in an open, sunny situation and in a light, sandy, though rich soil. When well-grown and carefully watered, the Phlox is known to flower during the heat of March, April, and May in places like Poona and Bombay. It is excellent for masses in the border and for solid beds. The various coloured varieties when planted in the border may be so arranged as to form almost a rainbow of colours. Its possibilities for the decoration of lawn and border are not fully appreciated. A good bed of Phlox is a sight which dazzles the eye with its brilliancy.

The annual Phlox is a winter-flowering annual on the plains of India and is best sown soon after the rains are over—say from September to November. On the hills, sow from March to May—weather permitting, the earlier the better. In Madras and Southern India, sow in October and November. In places with light rainfall, say not over

25 inches or so, it can also be grown during the rains, provided it is given a light, sandy but well-enriched soil, and an open situation.

Seeds usually germinate within two weeks, and the seedlings should be planted out at a distance of about 9 inches as soon as they are large enough to be handled. The plants should not be allowed to flower until they have made some growth and are bushy. Remove all flowers from young plants to induce them to branch out. They will then produce better and more numerous flowers.

There are various strains of the annual Phlox. The dwarf class grows very compact and low, and is hardly more than 8-9 inches tall. The *Grandiflora* type is more popular and usually grows about a foot high. The *Cuspidata* or Star Phlox is an interesting form and worth growing, not so much for its beauty as for its curious, pointed petals. It is a little dwarfer than the *grandiflora* type. The *Decussata* or perennial Phlox is quite distinct and produces very large heads of beautifully coloured flowers, similar to the annual Phlox, on bushy plants about two feet tall. It is very difficult to grow from seeds, seeds taking an unusually long time to grow and being very uncertain in their germination. It is, however, easily propagated by side-shoots which spring up near the base, from the roots.

SWEET PEAS.

Lathyrus Odoratus.

Until recently, this very desirable flower was inaccessible to gardeners in Southern India, except on hill stations. In Northern India, it grows very beautifully and easily. Even in Poona, the old-fashioned *Grandiflora* and Eckford Sweet Peas do not flower well, and, except for the few who have grown the new early (or so-called Winter-flowering) Sweet Peas with success, most people think it impossible to grow Sweet Peas in Poona. With the introduction of the Early, Winter blooming Sweet Pea, it is now possible to grow it with quite a fair degree of success almost everywhere in India, provided the fundamentals of its culture are understood and intelligently carried out.

The Sweet Pea has been so much improved in recent years in size, shape, form, colour and freedom of bloom, that it is safe to say that no other flower has produced the same number of new varieties in such a short time. Hundreds of new varieties have been added to the old list, and the old-fashioned *Grandiflora* type has been entirely superseded by the new Spencer type with larger and frilled flowers. Then again, the introduction of the Early-flowering type has given an impetus to the popularity of the flower. At first the flowers of the early type were small and only of a limited range of colours. But now, this type has been so much improved that we have dozens of new varieties of every shade of colour, and of the true Spencer or frilled type.

The Sweet Pea plant or vine, which is closely allied to the common garden or culinary pea, succeeds best in a deep, cool, moist soil and will do well under similar conditions. The soil should not, however, be wet, and must be well drained.

To secure a long season of bloom and fine large flowers, it is necessary that the seeds should be sown as early as weather permits. Where the rainfall is very light—say, about 25 inches or so—and the climate

cool and equable, the seeds could be sown at the beginning of the rains and also again in September and October. In other places, sow the seeds about September-October. On the hills, sow from March to May, and again in Sept.-October. When sown on the hills of Northern India in October, the plants, though they make very little top-growth in the winter, make a good root-growth, and flower long and freely the next spring and summer; but they should be protected during the winter, by means of straw, etc., from frosts.

The location should be open, away from trees and shrubbery where the plants get plenty of light and air. But, in places where the sun is very hot in the afternoons, it is advisable to select a plot so that the plants get some shade from the afternoon sun. They will grow in any good garden soil, but a rich clay loam will produce the brightest colours. The ground should be well prepared and dug deep—two feet being not too much—and a heavy application of well-rotted manure should be spaded under and thoroughly mixed with the soil. After the seed is sown, the ground should have a liberal top-dressing of manure. The plants of the *Grandiflora* and *Spencer* types usually grow about 4 to 6 feet tall and need the support of brush (twiggy branches of trees or of bamboos) which must be given when the plants are a few inches high. A trellis of some sort, or ordinary wire netting, may also serve the purpose. The Early or Winter-flowering Sweet Peas do not grow as tall as the old late-flowering types, and come into bloom at least a month earlier.

It is not advisable to plant either Peas or Sweet Peas in the same plot for more than two years in succession. They should be planted in a different place each season, unless grown by the trench method, in which the old soil is taken out and replaced by new soil and manure.

The seeds may be sown in drills about an inch to two inches deep and about two inches apart in the drills, covered with soil, firmly pressed down, and watered. The drills may be 3 to 5 feet apart in deep, rich soil, and where the weather is favourable to the cultivation of this plant. In other places, where the season of growth is not long enough, or where the soil and other conditions are not very favourable, the plants do not grow thick and tall, the drills may be quite close together—say, from 12 to 18 inches. Or they may be sown in small circular beds about 2 to 3 feet in diameter. When the plants come up and have grown a few inches high, the soil may be drawn near the stems so that the roots may be covered deeper with soil. They must be thinned out to stand at a distance of 4 to 6 inches apart, and must be given some kind of support to cling to, as soon as they are 3 or 4 inches high, or before they begin to fall down. An application of weak liquid manure or nitrate of soda, (two ounces dissolved to a bucket of water and applied to 10 feet of row once a fortnight), will be found very beneficial. Keep the ground well cultivated to a depth of at least 2 to 3 inches, and do not allow the surface soil to become hard or packed. A mulch of manure or straw about 2 to 3 inches deep will be found useful. The flowers, as soon as they begin to fade, should be removed from the plants and never allowed to set pods, as otherwise, they will stop flowering.

The trench system of planting, to which reference has been made in previous remarks, is practised where the finest flowers are desired

How this trench is made and planted is described under the heading of Peas (culinary) in Part II of the Guide. Many other cultural hints given for culinary peas apply with equal force to Sweet Peas. These may also be looked up under that heading.

ZINNIA.

The Zinnia is so well adapted to our climate that it has become popular all over the country. It is one of our most useful monsoon annuals and is now largely grown for sale as cut flowers by florists in Bombay, Calcutta, and other cities. It is, in fact, an indispensable annual and never fails to give satisfactory results.

The plants grow about 3 feet high, are bushy and carry large heads of brilliantly coloured flowers on long, strong stems which keep on the plants for weeks on end and are excellent as cut flowers.

The time of sowing and the general cultivation of the Zinnia is about the same as the Balsam, but it grows larger and should be given more space. The seedlings may be planted at a distance of about $1\frac{1}{2}$ to 2 ft. in very rich soil. As the first flowers of the best double sorts often come out single, it is advisable to pinch off the first buds and not allow the plants to flower until they are quite strong. At this time, a little stirring of the surface soil and a top-dressing of some quick-acting manure will greatly stimulate the plant's growth and the later flowers will be perfectly double and large.

The newer forms of Zinnias, notably the Dahlia-flowered, the Cactus-flowered or Quilled, and the Picotee-edged have greatly increased the popularity of this old-fashioned flower.

The *Grandiflora* or giant type, though a bit stiff and formal, produces huge flowers of various colours on bushy and rather tall plants about 3 feet high. The flowers though stiff, may be effectively arranged for house-decoration and show up most effectively under artificial light. There are many pure colours and as these combine well, the effects possible are charming. The dwarf or *pumila* class grows about a foot and a half high, and produces numerous medium-sized flowers and is well adapted for low beds. The *Haageana* or Mexican Zinnias are quite distinct from the ordinary *Zinnia elegans* and grow to a height of only about a foot, producing very small but numerous flowers of orange and yellow shades.

Activated Compost.

By Gilbert J. Fowler, D. Sc., F.I.C.

It is the custom of most gardeners to utilise the fallen leaves and other plant residues in the garden for the manufacture of leaf mould by storing these materials in a pit, together sometimes with a little cow dung to assist the process of rotting down into leaf mould to be used for next year's manure supply. In this way some of the plant food which has been taken from the soil by the growing plant is returned for next season's growth.

The chief constituents of plant food are the elements nitrogen, phosphorus and potash. These elements exist in various combinations in plant and animal residues.

NITROGEN occurs in animal refuse e.g., cattle dung and urine and also in leguminous plants such as peas and beans and the leaves of many trees.

PHOSPHORUS is present in animal refuse.

POTASH occurs in the stems and twigs of plants and consequently in wood ashes.

All these elements, therefore, are available in the waste materials of an ordinary garden and cowshed. In addition these materials when fermented or "rotted", furnish a brown residue known as humus which is essential to the healthy growth of plants and the proper tilth of the soil.

The ordinary method of making leaf mould as above referred to takes a long time in the course of which some of the necessary food elements may be lost, either by escaping into the air as in the case of nitrogen, or by being washed away into the soil. Moreover at no time does the temperature necessarily rise very high and so the larvae of insects are not destroyed and seeds of weeds may still be present to germinate later when the manure is put into the soil.

The product known as Activated Compost consists of the same elements but is made by a process which is much more rapid than the old leaf mould pit, which therefore obviates the loss of useful plant food and entails an exceptionally high fermentation temperature which eliminates all noxious constituents from the resulting compost.

A further advantage of this new method is that the composition of the ultimate manure can be controlled within limits and if necessary the percentage of the 3 important plant food elements—nitrogen, phosphorus and potash can be increased by suitable additions of "artificial", thus nitrogen may be added as sulphate of ammonia, and other suitable artificial compounds of nitrogen, phosphorus as bone meal or rock phosphate. Potash is seldom in defect since it exists in adequate amounts in most plant residues, but if necessary can be added in any of the forms of mineral potash fertilisers on the market.

A further advantage of Activated Compost is that if carefully prepared it may show an actual increase of nitrogen over what was originally present in the materials used owing to what is known as fixation of this element from the atmosphere by certain organisms present in the raw materials used, which have the power of combining with or fixing the free nitrogen of the atmosphere.

The new product is known as Activated Compost since the principle of activation is used in its preparation according to which a mass of actively fermenting material is first prepared to which fresh unfermented waste products can be added, the fermentation of which then takes place in much less time than when the reaction has to be started each time *de novo*. This principle is indeed made use of frequently by the ryot who finds that the rotting down takes place much more rapidly if a little of the last year's product is left in the pit to start the new fermentation.

By the new process instead of rotting down the material in a pit it is piled on the surface of the ground in a heap about 2 feet high and 3 feet wide at the base. These heaps are moistened with a solution of cow dung and urine to start the fermentation which soon produces a high temperature. The mass has to be stirred from time to time to ensure adequate aeration. The conditions, in fact, are closely analogous to those required in keeping an ordinary fire alight. When the temperature begins to fall a portion of the first heap can be withdrawn and used for starting a second heap and fresh material equivalent to the amount removed added to the first heap. The process thus becomes continuous and results in a series of heaps with fresh material at one end and heaps of partially unacted upon material in the middle, and finally a heap of material completely broken down into a smooth brown humus ready for storage or to be used at once as a fertiliser. From time to time the heaps must be moistened with further doses of the cow dung and urine solution, since if allowed to become dry fermentation ceases; but they must never be allowed to get sodden. To protect the heaps from rain a thatched shed should be put up. Protection from sun is not necessary.

With the foregoing general explanation the following detailed instructions may be better understood.

DETAILED INSTRUCTIONS.

Collect any material such as weeds, grass, leaves (green and dry), and other garden and household rubbish including garbage and ashes. Out of the material form a heap about 6 feet long, 3 feet wide at the base and 2 feet high, chopping any long stalks into small bits.

Take a basketful or a maund of fresh unmixed cow dung and make it into a thin mixture with urine and water.

SOLUTION Night soil may also be used with advantage instead of cow dung. A small quantity of bonemeal may be added with advantage.

With this solution moisten every portion of the heap thoroughly by sprinkling and stirring. Keep the heap moist from day to day until the temperature rises and then begins to fall decidedly and the material shows signs of disintegration and crumbles between fingers when handled. It is necessary to take the temperature of the material in the heap frequently. In Bangalore it rises up to about 50° to 70°C. This fermented material constitutes the "Starter" or "Activator."

At this stage remove a quarter of the heap of the activator (the first heap), and pile it about a foot away from the first heap; this pile is the beginning of the second heap. Make up the first heap to its original size with fresh material. This fresh

material should be thoroughly mixed with the rest of the first heap. How this can best be done is a matter for local convenience. Both the first heap and the first quarter of the second heap should be kept moist but not wet by further sprinkling with solution.

The temperature of the first heap will again rise. As it begins to drop remove a quarter of the heap again and mix it with the first quarter of the second heap which now becomes half the size of the first heap. Fill up the first heap as before with fresh material. Repeat these operations until the second heap equals the size of the first. The next operation will be to start a third heap by taking a quarter from the second heap, making up the second heap to its full size with a quarter from the first heap, which is again brought to its full size by a further addition of raw material. This process may be continued until the third heap is equal in size to the first and second heaps. It will be seen that fresh raw material is only added to the first heap.

It may be that by the time the third heap is complete and has been allowed a short period of final fermentation that the material will be ready for use, as is shown by the complete disintegration into a smooth humus of all the leaves and plant fibres. If this is so take away a quarter from the third heap, pass it through a screen to remove stones and twigs and either store it in a heap or use it at once. Fill up the third heap with a quarter from the second heap as before.

If on the other hand the decomposition does not appear complete begin a fourth heap in the same way taking a quarter from the third to start it. It is seldom that more than four heaps will be required. When this stage is reached it should be possible at intervals of not more than a fortnight to take away a quarter from the fourth heap for use, fill up the fourth heap from the third, the third from the second, the second from the first and the first with raw material.

Throughout the fortnight all the heaps should be kept moist by sprinkling further additions of the solution on to the heaps. It will be found that as the heaps become more and more ripe less solution will be required to keep them moist as the material naturally retains more moisture so that the first heap will always require the most and the last heap the least, no heap must be allowed to become sodden.

In course of time it will probably be found that the fermentation becomes more active owing to the development of the organisms specially suited to the local conditions. It may then be possible to take away half of each heap at a time instead of a quarter.

It will be seen that the total area and volume of the heaps required will depend on the quantity of refuse to be dealt with. If larger heaps are required they may be lengthened, but should not be seriously increased in depth or width.

The time required to prepare the first heap or Activator will naturally vary according to the character of the material dealt with, (whether soft, such as grass, weeds and soft leaves and stems of plants; or tough leaves such as mango, Java fig, etc.,) and the weather conditions, it may take less than a week, but should not exceed a month.

The last heap should be ready in about 3 months from the start.

If further explanation or advice is necessary in the application of the above instructions reference may be made to Dr. Gilbert Fowler, Central Hotel, Bangalore, South India.

INSECT PESTS and DISEASES.

The gardener's greatest enemies that take the largest toll of his produce and spoil the beauty of his gardens are the Pests and Diseases which plants are heir to. These attack plants with varying intensity at different periods of the year from the seedling-stage to the seeding stage, i.e., during the full plant-cycle. The infection is even carried to the next sowing year through the medium of seeds, bulbs, or soil, where they hibernate—in dormant condition—till they again get their teeth into the new season's seedlings. In some seasons there may be only a slight attack; yet in other seasons—plant pests and diseases can wipe out the whole garden.

No other animals bear such an intimate and complex relation to plants as insects do. The more luxuriant and varied the flora, the more abundant and diversified its accompanying insect fauna. If we examine any crop under normal conditions it is very rarely found altogether free from attack by insect-pests or diseases. Frequently half-a-dozen or more different kinds of insects will be found to be attacking it, some eating the roots, others the leaves, some boring into the stem, some sucking the sap and some eating the buds of flowers or damaging the fruits.

Let us now see what produces the pests and diseases with such devastating results. Every species of insect or organism of disease faces a life-long struggle for existence. Atleast one of the following conditions is favourable to the existence of plant pests and diseases.

- 1 Seedlings grown in very moist surroundings which afford extremely favourable prospects for the disease-organisms.
- 2 The placing of large areas under one class of plants.
- 3 The introduction of non-indigenous pests from other countries.
- 4 Insanitary conditions in the garden.

It should be therefore the first attempt of every garden-lover to ensure that none of these conditions is allowed to be present; so that he will have taken the first effective preventive measure against his enemies.

The control of insect pests and diseases depends on the application of common-sense methods based upon special knowledge of the insects and organisms concerned and of any particular circumstances under which they occur. For example, in the case of an insect pest of a crop some knowledge of the agricultural practice of the locality affected, together with a knowledge of the life-history of the insect in question, will often admit of the devising of a measure of practical control. The various means of control may be considered under four headings:—

- 1 Agricultural. 2 Mechanical. 3 Insecticidal. 4 Special.

1 Agricultural methods aim rather at checking any undue increase of diseases than at actual control after they have attained destructive magnitude.

They include:— (a) Clean cultivation.
 (b) The proper rotation of crops or plants.
 (c) Growing of mixed crops.

- (d) Changing the time of planting.
- (e) The use of poultry and insectivorous birds.
- (f) Stimulation of plant growth by means of manures.
- (g) Irrigation and drainage.
- (h) Selection of resistant varieties.
- (i) Ploughing or digging of the soil so as to expose it to the direct rays of the sun, and even in some cases, burying the top layer of soil.
- (j) Removal and destruction of attacked plants.

2 Mechanical methods are intended to check increasing attacks of diseases and pests. Amongst these may be included (a) in the case of diseases—removing affected parts or even the whole of the diseased plants; (b) in the case of insects—collection by hand, nets, light traps, attraction to baits and traps, trenching and burning, and removal of dead branches of plants.

3 Insecticidal Methods are used when insects have attained such numbers as to become a pest. Some insecticides are used as deterrents or repellents, but as a rule they should be used when damage is imminent or actually being done.

Insecticides are usually applied in the form of powders and liquids; and they are divided into "Stomach-poisons" and "Contact-poisons". For their correct application, some knowledge of the insects concerned becomes essential.

Stomach-poisons are applied to the plants in order that they may be eaten by those insects which have biting mouth parts; contact-poisons are applied to the insects themselves, and only, incidentally, to the plant in order to suffocate insects with sucking mouth-parts.

1 Lead Arsenate, is sold in the form of greyish paste or as a white powder. It is applied in the powdered form, but **STOMACH-POISONS** more economically as a liquid spray. The paste should be used at a strength of $\frac{1}{2}$ –1 oz. to four gallons of water; the powder at $\frac{1}{2}$ – $\frac{1}{4}$ oz. per four gallons. The Lead Arsenate does not burn the foliage due to the fact that it is insoluble in water, and sticks fast to the leaves.

2 Paris Green. It is a violent poison and may be applied dry as well as in liquid form. In any case it should be mixed with Lime in order to prevent the foliage being burnt due to any soluble arsenic. When applied dry, 16–20 times the same weight of hydrated or air slaked lime should be added and the mixture dusted lightly over the plants in the early morning. When used as spray— $\frac{1}{2}$ oz. to 4 gallons of water with 4 ozs. lump lime to be added to neutralize the soluble arsenic.

3 Lime-Sulphur. 3 gallons to 100 gallons of water.

1 Crude-oil Emulsion—20% softsoap + 80% crude kerosine oil. It is used at a strength of half a pint to a kerosine-tin of water, making certain that the mixture is properly strained. **CONTACT POISONS**

2 Fish-oil Resin Soap. Useful only against young scaly bugs, aphides and soft-bodied small insects.

3 Carbolic Acid Emulsion—It is an emulsion made up of soft soap with Crude Carbolic Acid. It is diluted with 20 parts of water for use as spray.

4 Tobacco Decoction—Destroys grubs, worms, and small insects. Gives excellent killing results against soft bodied insects without harming foliage.

5 Lime-sulphur or only sulphur is useful against mites, powdery mildew, and against jassids.

1 Bordeaux Mixture—This is a mixture of copper sulphate and quicklime in equal proportion and water. The addition of a little quantity of soft soap will be advantageous. The mixture is sprayed only on the affected parts.

2 Sulphur—Should be made into a fine powder and dusted—an ounce to an area of about 50 sq. feet. The irritation to the eyes of the workers caused by the sulphur dusting is easily counteracted by applying a solution of Soda Bicarb as a preventive to the eyes.

Dry Slaked Lime—Used effectively for bacterial diseases—Bacterial Ring—of potato.

Tobacco Dust—Used also as a repellent for insect pests.

1 The Spraying Syringe is the simplest and cheapest form of spraying and dusting, and suitable for small gardens.

Machinery

2 Bucket Sprayer, suitable for use in connection with a bucket or a kerosine tin. It is simply a pump, with an adjustable foot-rest and a length of rubber tubing.

3 Knapsack Sprayers—These are fitted with straps and intended to be hung over the shoulders like a knapsack. Very handy and convenient.

4 Pressure Sprayers—Easily portable and easily worked.

1 Fumigation of plants—This is a useful method for the treatment of a small number of affected plants to prevent extension of attack. The fumigant commonly used is Hydrocyanic acid gas produced by sulphuric acid on potassium cyanide. Plants should be fumigated preferably in the evening with great care.

2 “Ant-Exterminators”—White ants usually do much harm in a garden. This is a machine which pumps out a hot poisonous gas in the subterranean burrows of the white ants.

1 Fungoid Diseases, such as the Downy and Powdery Mildews, Necrosis, Rusts, Anthracnose, Blight, etc. These are best prevented by spraying the affected parts with Bordeaux Mixture.

2 Bacterial Diseases—Damping Off—If a large number of cress-seedlings are grown together under very moist conditions it is found that they become “diseased”. The disease begins at certain points and spreads in circles, and is caused by one of the species of *Pythium*. The disease can be stopped at an early stage by admitting abundant light and air, for it can thrive only under moist conditions. Applications of a very dilute solution of sulphuric acid just after the seeds are sown is also found to be a preventive.

3 Bacterial Ring of Potato—Cutting the potatoes into pieces before sowing and dusting them with sulphur or lime.

4 Slugs and Snails—These frequently attack young vegetable plants especially on the hills and in parts of Ceylon. They are best checked by

taking a bucketful of sawdust and moistening it with a mixture of 1 to 2 large cups of Phenyle and 10 to 20 cups of water; the sawdust is then spread around the rows of plants to be protected or around single plants. During wet weather a stronger solution may be employed with safety to the plants as the phenyle is slowly washed out of the sawdust. Ringing the earth around the stems with lime is also sometimes successful.

5 Caterpillar Pests—These are most voracious creatures. They attack and eat away the stems, shoots, roots, fruits, leaves, and buds of flowers.

Remedy:—(a) Pick up by hand and destroy them.

(b) Uproot the attacked plant and destroy it.

(c) Spray stomach poison, especially for caterpillars that eat away the young buds of roses, etc.

(d) Stem-borers of trees like the mango should be located first: then, a mixture of creosote and chloroform should be injected into the stem by means of a syringe.

(e) Destruction by means of a light (i.e., illuminated trap) of adult female moths which lay eggs. This method may be effectively applied to the common pest of cereals and others viz. the *Amsacta* species.

(f) After the season is over the land should be dug up and exposed so as to destroy the pupae which are usually laid in the soil.

For the ordinary red ants, see pp. 10-11.

6 White Ants or Termites—They generally attack the hard woody parts and the dead parts of plants. They live in colonies underground in their nests. Therefore to destroy them the remedy should be to locate such burrows and inject poisonous gases through pumping machines or to put petrol into the holes and then close them. Some specific "Ant-killers" are also now on the market.

The following remedies should also be tried with success:—

(a) Dig out all neighbouring ant-hills and destroy, particularly, the "queen-ant" who is responsible for the production of colonies of white ants.

(b) When the attack of white ants is visible, water the plants with a very weak solution of phenyle—2 to 4 per cent.

(c) A few drops of coal-tar should be mixed with water in the channel, and the water directed towards the plants and shrubberies.

(d) Castor-oil cake should be applied round the plants. It has a deterrent effect on the termites.

(e) The formula given on page 10 is also a practical one.

7 Bugs, Beetles, Aphides, etc.—These do not possess biting jaws and hence, the specific remedy to kill them is to apply contact poisons, such as Fish-Oil Resin Soap, or Nicotine or Tobacco wash.

8 Beetles in flower beds and lawns can be destroyed by watering them with soap solution or phenyle.

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